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I.

THE DIAGNOSIS OF OTITIC CEREBELLAR ABSCESS.

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Cerebellar abscess is due, in the majority of cases, to suppurative disease of the middle ear. In fact, in a series of eighty-six cases of cerebellar abscess, collected by the writer from the literature since 1907 (which is the date of publication of Neumann's monograph on otitic cerebellar abscess), eighty-five were due to ear disease. The importance to the otologist of being able to diagnose this grave condition is, therefore, apparent. Unfortunately, it is a disease which often runs its course with practically no symptoms. Okada found that in ten per cent of cases of cerebellar abscess, death occurred before any symptoms of intracranial involvement appeared. In fourteen per cent of the cases the symptoms of cerebellar abscess were obscured by other otitic complications. In forty-two per cent the diagnosis was rendered very difficult on account of the presence of other intracranial complications,

such as sinus phlebitis, pachy- or leptomeningitis, or temporosphenoidal lobe abscess. However, in the past few years important additions have been made to our knowledge of this subject, especially by Bárány.

A study of the anatomy and functions of the cerebellum will be of considerable assistance to us in diagnosing diseased conditions of this organ.

I will not go into the surface anatomy of the cerebellum, except to state that the lobes which are in relation to the posterior surface of the petrous pyramid are the biventral lobe and the posteroinferior lobe.

Bárány has been able to localize, in various parts of the cerebellar cortex, centers for movement of the various joints, in different directions. In the biventral lobe, just behind the internal auditory meatus, is the center for inward movement of the wrist joint. The center for position with palm downward is medial, and with palm upward, lateral. A little behind and above this is the center for inward movement of the shoulder joint, and just behind this for inward movement of the hip. Near the posterior pole of the hemisphere, at the medial end of the lobi semilunares superior and inferior, is the center for downward movement of the shoulder joint, and three to four centimeters outward from this point, on the edge of the hemisphere at the middle of the lobi semilunares superior and inferior, is the center for outward movement of the shoulder joint.

These facts were determined through observation of cases operated on for cerebellar abscess, through freezing of portions of the surface of the cerebellum, and through wounding of the cerebellum by operation. The study of cerebellar localization by animal experimentation has not been of very great value to us in this connection, for there is no close parallelism between the disturbances noted after destruction of portions of the cerebellum in the lower animals and those which the human clinic offers. In the human being the cerebellum has less influence on locomotion than in the lower animals. In the human being, when the motor centers of the cerebrum are destroyed, there is total paralysis. A dog can walk after total ablation of the cerebrum, provided the cerebellum is intact. In numerous cases of extensive disease of the cerebellum there are very few symptoms, probably because its functions are, in part, taken up by the cerebrum.

According to Bárány, the cerebellum contains centers in which the musculature of the body is represented according to the direction of movement. There are four centers: one for movement to the right, one for movement to the left, one for movement upward, and one for movement downward. Within these centers there is a subdivision according to joints, and according to positions of the joints. For example, in the center for movement to the right there are centers for the wrist, shoulder and hip joints, etc. And in the center for the wrist joint there is a center for movement with the hand in pronation, and one for movement with the hand in supination.

During rest there go from the direction centers in the cerebellum, to the muscles of the extremities, tonic impulses which hold the limbs quiet, the impulses from one center counteracting those from the other. When one center is destroyed the tonus from the opposite center overbalances, and there is spontaneous deviation or pointing-by of the limb. This deviation can only be elicited during voluntary motion—i. e., when the limb is held extended, as when an attempt is made to point to some object. The deviation is most marked after sudden destruction of a center. After a long time it may entirely disappear (compensation). The deviation is most marked when the eyes are closed, for if the patient is aware of his deviation he makes a voluntary effort to correct it.

If in an individual with a normal cerebellum a labyrinthine nystagmus is aroused by physiologic stimulation, there is a deviation of the extremities in the direction of the slow component of the nystagmus. This is known as the pointing reaction. But when there is a cerebellar lesion, the extremity affected by the lesion points correctly, in the presence of a vestibular nystagmus. In other words, there is a loss of the pointing reaction.

A lesion in one cerebellar hemisphere causes deviation only in the extremities of the same side. For example, with a lesion in the anterior portion of the right lobus biventer, there would be a loss of the inward tonus of the right arm. Consequently, on attempting to point at an object with the right arm, it would deviate outward. The left arm would point correctly. If, now, a horizontal nystagmus to the right is produced, either by cold water in the left ear, or by rotation to the left, the right arm would point correctly, whereas the left

arm, which receives its stimuli from the intact cerebellar hemisphere, would deviate to the left.

That pressure upon the cerebellum has the same effect as destruction of portions of the cerebellum was well illustrated by a case presented by H. J. Davis before the otologic section of the Royal Society of Medicine in 1913. A patient had had a large abscess in the right cerebellar hemisphere, which was opened. There resulted a cerebellar hernia, which healed over. There was spontaneous rotatory nystagmus to the left. Pressure on the hernia increased the nystagmus to the left. Syringing the right ear with cold water increased the nystagmus to the left. Pressure on the hernia caused a still greater increase of this nystagmus. Syringing the left ear with cold water caused a nystagmus to the right. Pressure on the hernia arrested this nystagmus. There was spontaneous deviation of the right arm to the right. Pressure on the hernia increased this deviation to the right.

Bárány was able to verify this localization in twenty cases of cerebellar disease. In three cases of cerebellar cyst, observed by Horsley, there was loss of the pointing reaction to the left in the left arm, on arousing a horizontal nystagmus to the right. A diagnosis was made of a lesion in the left cerebellar hemisphere. Operation by Horsley showed cysts.

A case of cerebellar cyst, also of the left hemisphere, was diagnosed by Bárány. There was loss of the pointing reaction in the left arm to the right, and sometimes downward.

A case of bilateral cerebellar cyst was seen by Auerbach. There was loss of the pointing reaction in both arms. Operation. Cure.

A case of cerebellar tumor was seen by Tetens Hald. There was loss of the pointing reaction of the arm on the diseased side outward.

A case of cerebellar abscess was seen by Bárány. A boy was operated on for cholesteatoma and sinus thrombosis. An extradural abscess was found in the posterior fossa. Two days later there was deviation of the right arm outward, and loss of the pointing reaction inward. Cerebellar abscess was diagnosed. Operation. Cure.

A case of cerebellar abscess was operated by West. After operation, examination showed loss of the pointing reaction inward of the arm on the diseased side.

Four cases of cerebellar abscess were seen by Ruttin, Bárány, Claus and Brühl with the typical findings.

One case of cerebellar abscess was seen by Bruns with the typical findings.

Two cases of meningoencephalitis were seen by Ruttin and Bondy.

Two cases of operative injury of the cerebellum were seen by Bárány. In one of these, two incisions were made in the cerebellum: one at the posterior pole of the right hemisphere —i. e., at the medial end of the right lobus semilunaris superior and inferior—and the second, three to four centimeters outward from this point, on the edge of the hemisphere—i. e., in the middle of the lobus semilunaris superior and inferior. The effect of these operative lesions was a deviation of the right upper extremity upward and to the left, which indicated a lesion of the center for downward tonus of the right arm, and of the center for outward tonus of the right arm.

Two cases of incision of the cerebellum in front of the sinus, in suspected cases of cerebellar abscess, were seen by Bárány. There was deviation outward of the arm on the operated side.

A case of cerebellar abscess was seen by Holmgren. There was loss of the pointing reaction inward of the arm on the operated side.

In five cases the freezing experiment was done. That is, the cerebellar cortex was frozen by an ethylchlorid spray, in cases where there was a bone defect over the cerebellum, resulting from operation. Freezing the cerebellar cortex causes a temporary paralysis of the cerebellar centers.

Of these five cases, one was examined twelve times; two, twice; one, three times, and one, once. Seventeen times the frozen portion was the anterior and lateral aspect of the lobus biventer. In all these there was a deviation of the arm of that side. On freezing posteriorly and outward there was also deviation of the leg outward, and loss of the pointing reaction inward.

The uniformity with which the characteristic deviations and changes in the pointing reactions occur in so large a number of cases demonstrates, beyond any doubt, the value of this method of examination in cerebellar abscess.

Lesions of the cerebellar hemispheres cause deviations of

the extremities. Lesions of the central lobe or vermis cause disturbances of the trunk muscles, with loss of equilibrium. When an artificial nystagmus is aroused, in the presence of a lesion in the vermis, the former will not influence the direction of the spontaneous falling; whereas, with an intact vermis, the direction of the nystagmus and the position of the head exert a definite influence upon the direction of the falling. For example, with a lesion of the vermis the patient falls when he attempts to stand up. The falling may be in any direction. We will assume that in the particular case under discussion the falling is backward. If, now, cold water be poured into the right ear, there will result a rotatory nystagmus to the left. This nystagmus will have no influence on the direction of the falling in the case under discussion, the direction remaining backward; whereas, if the vermis were intact, the falling, with the face forward, would be to the right.

The central gray matter of the cerebellum contains four pair of nuclei: the dentate nuclei, the nuclei tecti, the nuclei emboliformes, and the nuclei globosi. It is thought that the central nuclei have separate functions from the cortex of the cerebellum, just as the central nuclei of the cerebrum are considered as separate organs from the cerebral cortex.

The nucleus emboliformis and the nucleus globosus are merely prolongations upward of Bechterew's nucleus, which is one of the vestibular nuclei. In fact, all of the cerebellar nuclei are closely related to the vestibular nuclei.

The cerebellum is connected to the rest of the cerebrospinal system by means of three pairs of stalks or peduncles: a superior, a middle, and an inferior pair. The middle and inferior peduncles transmit, principally, the afferent fibers to the cerebellum, while the superior peduncles transmit the efferent fibers from the cerebellum. The afferent fibers to the cerebellum from the cerebrum reach the former through the middle cerebellar peduncles. The afferent fibers to the cerebellum from the spinal cord and medulla reach the former through the inferior peduncles or restiform bodies.

Two afferent tracts of fibers pass to the cerebellum from the spinal cord. They are Flechsig's tract and Gower's tract. Flechsig's tract is known as the direct cerebellar tract, and takes its origin from the cells of Clarke's column at the base

of the posterior horn of the cord. The tract lies in the lateral column of the cord, at the posterior part of its margin. It passes up through the inferior cerebellar peduncle to the anterior portion of the cortex of the superior worm.

Gowers' tract, known as the anterolateral ascending cerebellar tract, takes its origin from the same cells, at the base of the posterior horn of the cord, as Flechsig's tract, and lies at the margin of the lateral column of the cord, just in front of Flechsig's tract. It passes through the pons, winds about the superior cerebellar peduncle at the point of emergence of the latter from the cerebellum, and terminates in the ventral portion of the vermis.

The inferior peduncle contains a nucleus known as v. Monakow's nucleus. It receives fibers from the posterior columns of the cord, and sends its fibers through the inferior peduncle to the same side of the cerebellum.

These afferent tracts to the cerebellar cortex transmit sensory impulses from the joints and muscles.

From the inferior or medullary olive, fibers pass through the arcuate bundles to the inferior peduncle of the opposite side, and through this to the cerebellar cortex and central nuclei.

Just internal to the inferior peduncle is a bundle of fibers known as the juxtarestiform body. It contains the cerebellovestibular bundle, which consists of fibers that run between the vestibular nuclei and the cerebellar nuclei. The arcuate bundles also contain fibers that run from the vestibular nuclei to the cerebellum.

The afferent fibers to the cerebellum from the cerebrum pass through the middle peduncles. The fibers arise in the sensorimotor areas of the cerebral cortex, and pass down through the internal capsule and midbrain to the pons. Here they terminate about the pontine nuclei. From these nuclei fibers cross through the pons to the opposite middle peduncle, and then to the cortex of the cerebellar hemisphere.

Efferent fibers leave the cerebellum through two tracts. Fibers leave the dentate nucleus and pass through the superior peduncle to the red nucleus and the optic thalamus of the opposite side. From the thalamus, impulses reach the cerebral cortex through thalamocortical fibers. From the red nucleus, fibers pass down to the opposite side of the spinal cord, through

Monakow's bundle or the rubrospinal tract. This tract is situated in the lateral column of the cord in front of the pyramidal bundle. Its fibers terminate around the anterior horn cells of the cord. Thus each half of the cerebellum sends efferent fibers to the heterolateral cerebral cortex and the homolateral side of the cord.

The second efferent tract from the cerebellum also passes from the central nuclei, especially from the nuclei tecti. These fibers pass through the tractus uncinatus to the nuclei of Deiters and Bechterew, of the opposite side. From here fibers pass through the anterolateral segment of the cord to the anterior horn cells, and through the posterior longitudinal fasciculi to the oculomotor nuclei.

Thus we see that the cerebellum receives sensory impulses, sends out motor impulses, and is closely connected with the vestibular nuclei. Motor impulses reach the cerebellum from the cerebral cortex, and are there met by sensory impulses from the muscles and joints, and by impulses from the vestibular apparatus. These motor impulses are here acted upon in such a way by the centripetal impulses as to make them effective in maintaining the body equilibrium. Consequently, in cerebellar abscess there is no loss of muscular force; there are merely disturbances in the orderly execution of muscular movements.

Lesions of the fiber tracts in the cerebellum which connect the vestibular nuclei with the cerebellar nuclei, give rise to symptoms similar to those caused by lesions of the vestibular centers or of the vestibule itself.

Consequently, we may have, in cerebellar abscess, in addition to the general symptoms due to increased intracranial tension, and to the inflammatory process within the brain, symptoms of disturbed motility and symptoms of disturbances of the vestibular apparatus.

The disturbances of motility are the following:

1. Hypermetria.—The cerebellum seems to exercise an inhibitory influence on movements. In cerebellar lesions there is a suppression of this inhibition, resulting in unmeasured or immoderate movements. This is called hypermetria. It may occur in spontaneous movements, but is much more likely to occur in commanded movements. For instance, if a patient with cerebellar abscess is asked to touch the tip of his nose

with the end of his index finger, he will point past the nose. If a patient is seated, with the palm of his hand on the knee of the same side, and he is asked to supinate the hand, so that the back of his hand rests on the same spot where the palm was, the movement will be overdone, and the ulnar side of the hand will lie higher than the radial. A vertical line is drawn near the right edge of a sheet of paper. The patient is asked to draw horizontal lines, starting anywhere, but ending at the vertical line. The patient will continue all of his lines past the vertical line. In walking, at the beginning of the step, flexion of the thigh on the pelvis is more pronounced than normal, leading to excessive raising of the foot. At the end of the step the sole of the foot makes a greater noise than normal, in striking the floor, denoting excessive tension of the thigh.

The hypermetria is best brought out if the patient is asked to perform the movement quickly. For if it is done slowly he can correct the error. Vision has no effect on the movements. The same error is made with the eyes open as with the eyes closed. The direction of the movement is conserved. It passes the mark, and then deviates.

2. Cerebellar Asynergy.—If a patient with a cerebellar abscess is supported on either side, without his movements being influenced, and asked to walk, he will be stopped at his first step. The thigh is flexed and the foot is carried forward, but the upper part of the body does not move in harmony with the legs, the trunk remaining extended on the thighs. Thus, having placed his foot on the ground with much noise, at the end of the first step he can go no further. He is in danger of falling backward. It is necessary for the assistant to push the upper part of the body forward. Or the patient can help himself by pulling his trunk forward with his arms, his hands catching some support in front of him.

If a patient, standing up, is asked to bend his head back and curve his body backward, he falls, because he only bends the trunk back, without bending the legs on the feet, and the thighs on the legs. If a patient lies on his back, with his arms crossed on his breast, he cannot sit up. He flexes the thighs on his pelvis, and lifts the heels from the floor. These tests show that a patient with cerebellar abscess cannot synchronize the movements at the various joints in such a way as to perform an effective complex movement.

3. Adiadokokinesis.—This is the abolition or the diminution of the faculty of executing rapidly successive voluntary movements. In a cerebellar lesion, muscular force is intact. The patient can execute as rapidly as a normal individual the elementary movements, pronation or supination. But the complete movement (pronation and supination) he performs more slowly than a normal individual. The phenomenon becomes more manifest if the act is repeated a number of times.

The symptom is present only in an individual who can perform the isolated movements of pronation or supination with normal rapidity. For if he cannot do this, he cannot, of course, perform a rapid succession of the two movements. It is sometimes bilateral and sometimes unilateral. In the latter case it is on the same side as the cerebellar lesion.

4. Tremor.—On attempting to point to an object with one of the extremities, orientation is correct, but the movement is not uniform. There are oscillations in different directions. The tremor occurs only during voluntary contractions of the muscles. It varies in different individuals, and in the same individual at different times. It may diminish if the patient is left to himself and not observed, and if he executes movements slowly and carefully. On pointing to the nose with the finger, the movement to the nose may be straight, and then, at the end, there may be violent tremor.

5. Disturbances in Writing.—Ask the patient to make a dot on a sheet of paper with a pencil. He rarely succeeds at the first attempt. At first he goes through the paper, or breaks the point of the pencil. At the second attempt he stops above the paper. Finally, finding the surface of the paper, he makes, not a dot, but a line. Cerebellar patients place commas and not dots over their i's. This is hypermetria. If they are asked to draw a line of a certain length, they will extend it further. On attempting to draw a circle or an arc, as in the letter O or C, the figure is polygonal. In attempting to reproduce regular zigzags, as in M and N, the angles are badly formed and the lines irregular. Having arrived at the end of a line, the patient finds it difficult to begin a new line in the opposite direction. The irregularities in writing are the result of tremor, hypermetria, asynergy and adiadokokinesis.

6. Disturbances of Speech.—Speech is scanning, jerky, a little explosive, and sometimes dragging. It is similar to that in disseminate sclerosis.

7. Atony or Hypotony.—Hypotony is present in a few cases. It is sometimes bilateral and sometimes unilateral, in which case it is on the same side as the other symptoms. An experiment for determining the presence of hypotony of the extensors of the arm is as follows: ask the patient to flex his forearm, and oppose this by traction on his forearm. Suddenly stop the traction. In a normal person there results pronounced flexion, followed by a violent extension. In cerebellar lesions this extension is only indicated or altogether wanting.

8. Cerebellar Catalepsy.—This is a rare symptom. Voluntary muscles are held immobile for a long time, without being contracted, in certain positions where volitional equilibrium is realized. It often appears as follows: the patient lies on his back, thighs flexed on pelvis, legs lightly flexed on thighs, feet separated. When he assumes this attitude his legs and trunk oscillate in various directions, especially from left to right, and vice versa, but at the end of several seconds the body and lower limbs become fixed. This fixity is more marked than a normal individual can attain. It persists for several minutes, and causes no sensation of fatigue. In cerebellar affections, volitional kinetic equilibrium is diminished, while volitional static equilibrium is preserved or even increased.

9. Spontaneous Deviation of the Extremities, and Loss of Reaction Movements.—These symptoms, as worked out by Bárány, are of extreme importance in the diagnosis of cerebellar abscess. The method of examination is as follows: the patient is seated with his eyes closed. His arm is extended before him, and the index finger of his hand is made to touch the palm of the examiner's hand. The arm is then dropped until the hand touches the knee, and then raised until it again touches the examiner's hand. With a normal cerebellum the patient points correctly. With a lesion in the shoulder area of the cerebellar cortex, the arm will deviate either inward or outward. If the lesion is in the right biventral lobe, the right arm will deviate outward, or to the right. If the lesion is at the middle of the margin of the right cerebellar hemisphere —i. e., at the middle of the right posterosuperior and posteroinferior lobes—the right arm will deviate inward, or to the left. The former area contains the center for inward tonus of the shoulder joint, and the latter the center for outward tonus of

the shoulder joint. The left arm will point correctly. The deviation involves only the side of the body on which the lesion occurs.

The movements of the elbow joint are examined by resting the elbow on the back of a chair and moving the arm from the elbow. The movements of the wrist joint are examined by resting the wrist on the back of a chair and moving the hand at the wrist. The wrist joint is examined with the hand in pronation, and then with the hand in supination, there being a separate center for each position of the hand. The wrist center lies in front of the elbow center. The hip is examined in a similar way. The hip center is behind the arm center. These tests should be made repeatedly, in order to make sure that there really is a deviation, and the patient must not know when he has made an error in pointing, in order that he should not make a voluntary effort to correct the error.

Where the lesion in the cortex is a large one, many or all of the joints will be involved in the deviation. Where the lesion is small, only one or two joints will be involved.

Having determined the presence of a spontaneous deviation, the next thing is to test the reaction movements of the extremities. This is done by arousing an artificial nystagmus. If the patient is rotated to the left, he will have an after-nystagmus to the right. If the patient's arms are now held in front of him, they will both deviate to the left—i. e., in the direction of the slow component of the nystagmus—provided the cerebellum is normal. If, however, the patient has a lesion in the right cerebellar cortex, involving the center for inward tonus of the shoulder joint, the right arm will point correctly, while the left arm will deviate to the left. Therefore, with destruction of this center there is a spontaneous deviation of the arm outward, and a loss of the reaction movement inward. Instead of rotation, the caloric test may be used to arouse the reaction movements, the head being tilted back sixty degrees in order to elicit a horizontal nystagmus.

If a cold caloric is done in the left ear, and the head held upright, the arms held in front of the body will deviate to the left. If the right arm is moved laterally, it will deviate upward. If the left arm is moved laterally, it will deviate downward. If the head is now rotated to the right shoulder, both arms held in front of the body will deviate downward. If the

head is rotated to the left shoulder, both arms held in front of the body will deviate upward. The deviation depends upon the plane and direction of the nystagmus, and the position of the head. It is always in the plane of the nystagmus, and in the direction of the slow component of the latter.

Where there is a spontaneous deviation, but no loss of reaction movement, the lesion is probably remote, and causes impairment of function by pressure, and not by actual destruction of the center.

A deviation of the right arm to the right may be due either to destruction of the right center for inward tonus of the shoulder joint, or to hyperstimulation of the right center for outward tonus of the shoulder. In order to determine which of these conditions is present, the reaction movements of the right arm are compared with those of the left arm. If the reaction movement to the left of the right arm is wanting, there is destruction of the right center for inward tonus. If the reaction movement to the right of the right arm is greater than that in the left arm, there is a hyperexcitability of the right center for outward tonus of the shoulder.

When the deviation is in one direction only, and with increase in intracranial pressure it spreads to all the joints without taking a new direction, we are dealing with a cortical cerebellar lesion, rather than a lesion of the fiber tracts. This is analogous to monoplegia in the cortex of the cerebrum. When the deviation and loss of reaction movements is in more than one direction, we are probably dealing with a lesion in the central portion of the cerebellum, involving the fiber tracts.

10. Spontaneous Falling and Reaction Movements of the Trunk.—With an abscess involving the worm there is a tendency to fall. The falling may be in any direction. The direction of falling was noted in thirteen cases out of the eighty-six cases collected. Of these, ten cases fell to the side of the lesion, and three cases to the opposite side. If spontaneous nystagmus is present, the direction of the falling does not bear any definite relation to this nystagmus.

If an artificial rotatory nystagmus is aroused by means of cold or hot water in the ear, the patient falls in the direction of the slow component of the nystagmus, when the vermis is intact. For instance, if cold water is allowed to flow into

the right ear, the patient falls to the right. If the head is turned to the right shoulder, the patient falls backward. However, if there is a lesion of the vermis, and the spontaneous falling is, for instance, forward, the direction of the falling would not be changed by the production of a caloric nystagmus. In other words, the falling reaction is wanting. There may be an absence of the falling reaction without spontaneous falling. The loss of the falling reaction may be in one or several directions. In the latter case the lesion would be larger and more centrally located than in the former case.

In order to differentiate between focal lesions and symptoms due to pressure from a distance, we must make a careful examination of the spontaneous symptoms as well as a careful functional examination. If there is spontaneous falling or deviation of the extremities, and on eliciting the proper nystagus, a falling or deviation in the opposite direction is elicited, we are dealing with a distant lesion. If, on examination at different times, there is sometimes deviation and falling and sometimes none, we are surely dealing with a distant lesion. If only a portion of the symptoms change, there is a combination of focal lesion and lesion at a distance. If, after a decompression operation, the symptoms disappear, there is a lesion at a distance. Constant symptoms, or symptoms which increase in severity, are due to focal lesions.

11. Hemiparesis.—This symptom occurs occasionally in cases of cerebellar abscess. It was noted in six cases out of the eighty-six collected from the literature. It is always on the same side as the cerebellar lesion.

12. Fixed Attitude of the Head.—In a few cases of cerebellar abscess the head is held stiff and rigid, and bent toward one shoulder. The cause of this attitude is not definitely known. It may be due to increased tonus of the neck muscles of one side. In experiments on dogs, where half of the cerebellum is removed, one of the most striking symptoms is the lateral deviation of the head and the lateral curvature of the entire body.

The symptoms which are due to destruction of the fiber tracts between the vestibular nuclei and the central nuclei of the cerebellum are nystagmus, vertigo and loss of equilibrium. The loss of equilibrium we have discussed above. The nystagmus due to cerebellar disease cannot be distinguished from

that due to disease of the vestibular apparatus. It varies in its direction. Nystagmus was noted in forty-six out of the eighty-six cases. It was directed to the diseased side fifteen times, to the sound side seven times, to both sides twenty-two times, and in two cases the direction was not mentioned. A nystagmus to both sides, horizontal in one direction and rotatory in the other, is rather characteristic of cerebellar disease.

Although the appearance of cerebellar nystagmus does not differ from that of labyrinthine nystagmus, yet its behavior does. Labyrinthine nystagmus, when due to a diffuse labyrinthitis, gradually diminishes in intensity and stops in a few weeks. The direction of such a nystagmus is always away from the diseased ear. Cerebellar nystagmus remains the same or becomes worse. A nystagmus toward an ear of which the labyrinthine functions are destroyed cannot be labyrinthine in origin. It must be retrolabyrinthine, probably cerebellar. In some cases there is a dead labyrinth, with nystagmus toward the opposite side. During the course of the disease the nystagmus suddenly changes to the diseased side. This usually indicates a cerebellar abscess. The nystagmus of a circumscribed labyrinthitis is difficult to differentiate from that of a cerebellar abscess. In the latter case we often have other intracranial symptoms to guide us. Neumann recommends doing a labyrinthectomy in cases of doubt. If there was a circumscribed labyrinthitis the nystagmus will shift toward the sound side. If the nystagmus remains directed to the diseased side we are dealing with a cerebellar abscess.

If cold water be allowed to flow into an ear, and the flow stopped as soon as nystagmus sets in, the nystagmus will continue for one to two minutes, under normal conditions. In cerebellar disease the caloric nystagmus which is directed toward the affected hemisphere will continue for five or ten minutes, or even longer. This is called by Neumann, "enduring nystagmus," and is due to the loss of the inhibitory control which the cerebellum exercises over the vestibular centers.

Vertigo was present in fifty-six out of the eighty-six cases. There is nothing characteristic about cerebellar vertigo. Its intensity is not influenced by looking in different directions, as vestibular vertigo is.

A symptom due to disturbances of the sensory impulses

was first described by Lotmar in the *Monatschrift für Psychologie und Neurologie*, 1908, and later confirmed by O. Maas and others. This is the underestimation of weights by the hand on the side of the cerebellar lesion. A series of weights is prepared, which are the same in size but different in weight. A weight is put into each hand, and the patient asked to judge whether they are equal or not. With a cerebellar abscess on the right side, a heavier weight in the right hand will seem to equal a lighter weight in the left hand. This symptom must be judged very carefully, for in right handed individuals the left hand normally overestimates weight slightly.

Changes in the reflexes were mentioned in seven cases out of the eighty-six. They were increased in five cases, and diminished in two cases.

Out of the above mentioned symptoms there may be only one or a few present, or there may be none at all. The cerebellar abscess may only be found at autopsy. Latent cases are of two kinds:

1. Where there never were symptoms. This might be due to separation of the nervous elements without their destruction. This is more probable in cases of tumor or hemorrhage than with abscess. It may be due to involvement of a silent area of the cerebellum.

2. Where there are symptoms at the beginning, which later disappear. This is due to compensation. Cerebellar symptoms may be made more marked and enduring by the association of lesions in compensatory organs (cerebrum, labyrinth and sensory paths). For instance, in disease of the cerebellopontine angle the eighth nerve is involved along with the cerebellum. This gives very severe symptoms.

The symptoms due to increased intracranial pressure are headache, vomiting, drowsiness, slow pulse, optic nerve changes, pupillary changes, and paralyses of the cranial nerves.

Headache was mentioned in seventy cases out of the eighty-six. It is the most constant of all the cerebellar symptoms. It is usually intermittent, as are most of the general cerebellar symptoms. There are often periods when the patient feels perfectly well. The location of the headache is not characteristic, but it is most often an occipital headache.

Vomiting occurred in forty-eight of the cases. It may occur

with or without nausea. There are two types: projectile vomiting, due to increased intracranial pressure, and vomiting accompanied by nausea, which is due to involvement of the vestibulocerebellar tracts. Nausea without vomiting is mentioned in four cases.

Drowsiness was noted in thirty-two of the cases. Delirium or hyperexcitability is rare.

A slow pulse was present in thirty-eight cases. The pulse is always slow in relation to the temperature. When the temperature is normal or subnormal, the pulse may be as low as forty or fifty. When the temperature is raised by a complicating meningitis, the pulse is apt to be around seventy.

Optic nerve changes were present in sixteen cases. The condition found is usually an optic neuritis, but occasionally there is choked disc. It may be unilateral or bilateral, and, if unilateral, may be on the affected side or the opposite side. The impairment of vision is usually not great.

Inequality of the pupils was present in four cases, and in two cases the pupils were dilated and equal. Inequality of the pupils is usually due to the accompanying meningitis.

Paralyses of the third or sixth nerves were present eleven times. This is due either to basilar meningitis or to pressure on the nerves. In some cases there is present, instead of a third or sixth nerve paralysis of one side, a conjugate deviation of the eyes. This may be accompanied by a deviation of the head.

Facial paralysis or paresis occurred in twenty-seven cases. In the majority of these cases the paralysis was due to involvement of the facial nerve in the temporal bone, as the result of the accompanying labyrinthine suppuration. In a few cases it was due to pressure on the intracranial portion of the nerve.

Difficulty in swallowing occurs occasionally. This is due to pressure on the medulla.

The symptoms due to the inflammatory process in the cerebellum are temperature, changes in the cerebrospinal fluid, blood changes, and emaciation.

The temperature was noted in fifty-five of the cases. It was above 100° F. in twenty-three cases. It was between 98.6° F. and 100° F. in twenty-one cases. It was subnormal in eleven cases. The higher temperatures usually occur in the terminal stages when a meningitis has set in.

The cerebrospinal fluid was examined in twenty-four cases. It was normal in nine cases. It was normal, but under increased pressure, in two cases. It was cloudy and sterile in eight cases, of which three were under increased pressure. It contained bacteria in only five cases.

The blood changes of cerebellar abscess are not characteristic. There may be a leucocytosis with a high polynuclear count, or the blood picture may be normal. No cases of bacteremia have been reported in uncomplicated cases of cerebellar abscess.

Emaciation is always very marked in cerebellar abscess. The patients are cachectic in appearance. They are usually constipated, with coated tongue and fetid breath. There is rarely any bladder disturbance, except just before death.

The order of frequency of the symptoms noted in the eighty-six cases collected is as follows:

	Cases.		Cases.
Headache	70	Optic nerve changes	16
Vertigo	56	Incoordination of arms	12
Vomiting	48	Paralysis of third or sixth nerves	11
Nystagmus	46	Changes in the reflexes	7
Slow pulse	38	Hemiparesis	6
Drowsiness	32	Pupillary changes	6
Unsteady gait	32		
Facial paralysis or paresis	27		

CASE HISTORIES.

Case 1. Amberg, E.[1]—Female, aged four years. Otitis media suppurativa chronica. Admitted September 3, 1906.

September 6—Radical mastoid operation.

September 11—Incised lateral sinus. Free bleeding. Jugular ligation.

September 13—Temperature, 106.2° F.

September 15—Exposed dura of middle fossa. Dura looked healthy. Exposed cerebellum. Deep epidural abscess. Cerebellar abscess.

Patient discharged, October 10, 1906.

Case 2. Auerbach, J.[2]—Male, aged fifty-one years. Grippe. Pain in right ear. Right membrana tympani red and bulging. Slight tenderness over mastoid. Tenderness along anterior border of right sternomastoid. Pulse, 66; temperature, 99° F.

Right ear, bad hearing. (Bárány noise apparatus used.) Membrana tympani incised. Drowsy. Mastoid operation two weeks later. Dura of middle fossa covered with granulations. Next day, slight rotatory nystagmus to right. Nausea, headache. Temperature, 102° F.; pulse, 90. Next day, chill; temperature, 103° F.; pulse, 108. Slight opisthotonos. Kernig marked. Temporosphenoidal lobe incised; no pus. Sinus found thrombosed. Abscess found in cerebellum. Jugular ligated. Exitus in a few hours.

Case 3. Bárány, R.[7]—Boy. Radical mastoid and sinus operation. Two days later, drowsiness, headache, and, on examination, the right arm pointed past, about fifteen centimeters to the right. Cold caloric in the left ear gave nystagmus to the right, and left arm and both feet deviated to the left, whereas, the right arm only deviated less to the right. Cold caloric in the right ear caused more marked deviation of the right arm to the right, and deviation of the other extremities to the right.

Two days later, opened cerebellar abscess, which lay just behind and external to the labyrinth. Two days later the spontaneous pointing-by had disappeared, but there was loss of pointing reaction to the left in the right arm. Six weeks later there was again normal pointing reaction to the left in the right arm.

Case 4. Barr, J. S.[8]—Infective labyrinthitis with septic thrombosis of lateral sinus. Opening in sinus wall leading to abscess cavity in cerebellum. Operation on labyrinth, cerebellum, sinus, and internal jugular vein. Death from purulent leptomeningitis. (Probably saccus empyema. A. B.)

Case 5. Barr, J. S.[8]—Subdural abscess, operated on. Later, cerebellar abscess was discovered and drained. Contained mixed staphylococci. Autogenous vaccins used. Recovery.

Case 6. Beck, J. C.[9]—Male, aged nineteen years. Otitis media suppurativa chronica in right ear since childhood. Six weeks ago, pain on right side of head, gradually increasing.

October 28, 1906—Pain, almost unbearable. Hearing markedly reduced. No dizziness. Temperature, 97° F.; pulse, 55 to 60.

November 1—Radical mastoid operation. Improvement of symptoms. Five days later, facial paresis. Pulse and temperature remained same. Nine days after operation patient suddenly died.

Postmortem—On opening tentorium a small opening was seen on surface of right half of cerebellum, close to median line. On enlarging this opening, escape of an ounce of pus. No disease in labyrinth. Meninges normal.

Case 7. Beck, K.[10]—Male, aged twenty-four years. Otitis media suppurativa chronica in both ears for ten years. For a week, vertigo and headache. Holds head directed toward left. Uncertainty in gait. Pulse, 50 to 60. Right ear has hearing. Positive caloric. Left ear, negative caloric. Lumbar puncture, turbid liquor, under pressure; sterile.

Radical mastoid operation, left. Sinus and dura of middle fossa bare. Puncture of sinus and dura of both fossæ negative. Two days later, exitus.

Postmortem—Thrombosis of sigmoid and inferior petrosal sinuses, right. Purulent circumscribed leptomeningitis about right cerebellar hemisphere. Cerebellar abscess, right. Perforation through inner wall of antrum into extradural space. Extradural abscess. Thrombosed vessels and pus cells in dura. Necrotic brain tissue between dura and abscess in cerebellum. Pial sheath infiltrated with round cells. Small abscess in pial sheath.

Case 8. Beck, K.[10]—Female, aged forty-six years. Grippe. Ten weeks later, earache, right. Four weeks ago, abscess behind right ear, incised. For past three days, vertigo and vomiting Head is held bent toward left side. Nystagmus on looking forward. Increased on looking to right. Stopped on looking to left. Both discs hazy. Right ear discharging. Has hearing. When eyes are closed, falls to the left. Caloric positive.

Mastoid operation. Epidural abscess in posterior fossa. Vomiting. Spontaneous nystagmus to sound side. Slight somnolence. Puncture of cerebellum medial to sinus; pus found; incision; drainage. Improvement for four weeks, then rise of temperature to 39.9° C. Sinus operation; thrombus. Three weeks later, symptoms in lungs; five days later, exitus.

Postmortem—Thrombosis of right transverse sinus, and a meningeal vein of right temporosphenoidal lobe. Gangrenous areas in both lungs. Empyema. Pneumonia. No pus in cerebellar abscess. Fibrous healing.

Case 9.—Biggs, G. M.[12]—Male, aged thirty-five years. Admitted September 17, 1908. Vertigo, two weeks. Tendency

to fall to the right. Slight nystagmus in both directions. Otitis media suppurativa chronica, right, twenty years. Right grasp weaker than left. Some incoordination on right side in rapid rotation of hand. Dullness and apathy. Temperature, 98° F.; pulse, 60.

Radical mastoid operation. Cholesteatoma. External semicircular canal carious. At 10 p. m., unconscious. Temperature, 101.2° F.; pulse, 88.

Second operation. Trephine one and one-half inches behind and three-fourths inch below external auditory meatus. Cerebellum incised; pus. Patient improved. On September 22d, vomiting, drowsiness and irritability. Pulse, 60; temperature, 97°. Left pupil more dilated than right. Respirations, 16. Lumbar puncture showed normal fluid. Temporosphenoidal lobe and cerebellum explored with negative results. Exitus, September 25th.

Postmortem—Ventricles distended with clear fluid. Cerebellar abscess.

Case 10. Black, W. D.[13]—Male, aged fourteen years. Otitis media suppurativa acuta, right, four weeks. Headache above right ear, radiating to frontal region. Vomiting; vertigo. Pulse, 60 to 70; temperature, normal. Drowsiness. Paracentesis. Five days later, Schwartze-Stacke operation. Pus in antrum. Sinus exposed. Looked normal. Temporosphenoidal lobe exposed and explored. No pus found. Fifteen days later, brain prolapse resected. Opening filled in with silver screen. Death on table.

Postmortem—Abscess in right lobe of cerebellum.

Case 11. Bourguet.[14]—Female, aged fifty-four years. Otitis media suppurativa chronica, right, since infancy.

September 10, 1912—Headache, vertigo. Walking difficult.

September 20—Curettage of middle ear. Headache became more violent. Vomiting.

September 30—Curettage again.

December 3—Headaches worse. Spontaneous nystagmus to both sides, more marked to right. Caloric negative. Right eighth nerve paralyzed. Soft palate moves less on right than on left side. Paralysis of hypoglossal, right. Tongue deviates to right. Pulse, 100; temperature, normal. Falls to right. Adiadokokinesis.

Operation; cholesteatoma. Descending portion of facial is

exposed. Sinus exposed. Labyrinthectomy. Cerebellum incised; pus. Cure.

Case 12. Braun, A.[15]—Male, aged fifty-eight years. Admitted July 3, 1909. Otitis media suppurativa acuta, right, for two weeks. Mastoid tenderness. Temperature, 102° F. Simple mastoid operation. Perisinus abscess. Hole in outer wall of sinus. Clot in sinus. Jugular resection. Clot evacuated from sinus. Temperature normal next day. Remained normal for thirteen days.

July 16—Headache. Temperature and pulse normal.

July 19—Headache. Temperature, 102.4° F.; pulse, 72.

July 23—Chill; apathy. In afternoon, all the signs of a well marked meningitis. Lumbar puncture showed a turbid fluid containing pus cells and pneumobacillus of Friedländer.

July 24—Exitus.

Postmortem—Pia bathed in thick creamy pus, extending to base of brain and down into spinal canal. Ventricles full of pus. Superficial abscess in right lobe of cerebellum, a short distance behind obliterated sinus.

Case 13. Brühl, H.[16]—Female, aged twenty-seven years. Cholesteatoma, facial paralysis, ataxia, deafness, dead labyrinth on diseased side, marked nystagmus to diseased side, and increased vestibular irritability of the opposite side. Spontaneous deviation of the arm of diseased side outward. The inward reaction after turning was wanting. In the opposite arm the reaction was present. Abscess could not be found at operation.

Postmortem—Cerebellar abscess three centimeters from the surface, in the lobus biventer.

Case 14. Curtillet and Aboulker, H.[18]—Male, aged forty-seven years. Otitis media suppurativa chronica, right, for two years; bloody discharge. Deafness for a long time. Three months before, at the beginning of 1910, intense vertigo.

In November, 1910, intense earache.

January 6, 1911—Vomiting and headache. Cannot stand. Three weeks before, facial paralysis, right. Right leg weaker than left. No adiadokokinesis. No dysmetria. Kernig. Spontaneous nystagmus in both directions. Pulse, 60; temperature, 36.2°. Lumbar puncture shows cerebrospinal fluid under pressure and clear; sterile; contains a few white cells. Positive caloric. No hearing, right and left.

January 11—Operation. Puncture of temporosphenoidal lobe, negative.

January 15—Second operation. Incision of cerebellum; pus. Cure.

Case 15. Davis, H. J.[19]—Boy, aged eight years. May 20, 1912, simple mastoid operation, right. Large epidural abscess in posterior fossa.

June 10, three weeks later, drowsiness, optic neuritis and nystagmus to the opposite side. Evacuated large abscess in right cerebellar hemisphere. Hemorrhage from lateral sinus. Hernia of cerebellum. It receded after a time until it was flush with surface of head and skinned over. Cure.

Spontaneous rotatory nystagmus to left. Pressure on hernia increases nystagmus to left. Syringing diseased ear with cold water causes nystagmus to the left. While syringing, pressure on the hernia increases intensity of the nystagmus to the left. Syringing sound ear with cold water for one minute causes horizontal nystagmus to the right for two minutes. On another day, horizontal nystagmus to right is arrested by pressure on the hernia.

Pointing Tests.—Up and down test, deviation to right. Side to side test, accurate. Pressure or application of ice to the hernia increases the deviation to the right, in the up and down test. Does not alter the accuracy of the side to side test. In pointing tests with feet there is also a deviation to right in up and down test. No change in side to side test.

Case 16. Dench, E. B.[20]—Male, aged four years. No history obtainable. Had mastoiditis, right. Simple mastoid operation. No dura exposed. Death, four days later.

Postmortem—Small perforation in inner table, over lateral sinus. Perforation led through sinus, which was thrombosed, into abscess cavity, in cerebellum. The patient presented no symptoms of cerebellar disease.

Case 17. Dench, E. B.[20]—Male, aged twenty-six years. Double otitis media suppurativa chronica for eight years. In the spring of 1905, emaciation. Suppuration on left side more profuse. In October, 1905, radical mastoid, left. Facial paralysis three days later, which almost entirely disappeared a month later. Five months later, nausea and vomiting, diplopia and recurrence of the facial paralysis. Marked incoordination of upper and lower extremities. Paresis of left external rectus

and left superior oblique. Slight congestion of retinal veins of both eyes. Temperature, subnormal; pulse, 60 to 70. Polynuclears, 72 per cent. Headache and slight rigidity of neck.

Operation. Cerebellum exposed and explored behind sinus. No pus found. Death three days later.

Postmortem by Dr. G. S. Dixon.[21]—Dura normal. Seropurulent leptomeningitis, more intense on left side. The arachnoid was studded with very fine points, suggesting tuberculosis. No meningitis at base. Both lateral ventricles contained much bloody serum. Small necrotic area on upper surface of left quadrate lobe of cerebellum. On cutting through this an abscess was found, involving both hemispheres and the worm. Nodular tumor involved seventh and eighth nerves, in the internal auditory canal. Fibrosarcoma. No erosion of internal auditory canal. Cochlea completely destroyed by growth, also vestibule.

Case 18. Dench, E. B.[20]—Male, aged thirteen years. Acute exacerbation of otitis media suppurativa chronica, right, with mastoid symptoms. Radical mastoid operation. Evacuation of perisinus abscess. Two days later, slight temperature elevation. Leucocytosis, 33,600. Polynuclears, 84 per cent. Temperature rose to 104° F., and he became stupid and complained of severe headache. Cerebellum was exposed both in front of and behind sinus, and a cerebellar abscess was found. Through and through drainage. Patient died twenty-four hours later.

Case 19. De Stella.[22]—Female, aged twenty-three years. Otitis media suppurativa chronica, right. Vertigo and disturbances of equilibrium. No nystagmus. Radical mastoid caused no improvement. Vomiting, occipital headache, slow pulse, drowsiness. Papilledema at end, and crossed hemiplegia (right facial and left extremities). Patient had hearing in right ear, and static labyrinth responded to stimulation. A cerebellar abscess was diagnosed, but operation was refused. Autopsy disclosed an abscess in the worm, and in a large portion of the right cerebellar hemisphere, breaking through the middle peduncle into the pons.

Case 20. Dighton, Adair.[23]—Female, aged thirty years. Admitted May 7, 1913, with subacute mastoiditis, left. Temperature, 98° F.; pulse, 100. Discharge for six months. Labyrinth normal. Heath operation. Next day temperature 103° F.;

pulse, 92. A week later, slight nystagmus toward diseased side. Left hand pointed by to the left. Right hand pointed correctly.

Second operation. Incised left cerebellar hemisphere. Pus, which contained pneumococci and diphtheroid bacilli. Recovery.

Case 21. Dortu, P.[25]—Male, aged forty-one years. On March 11th, sudden earache, right. Paracentesis, repeated in a few days. Repeated several times during two months.

May 17—Pain over mastoid, in neck, vertigo and nausea.

May 21—Operation. Perisinus abscess. The following day patient felt well. Three days later, temperature, 36.5° C.; pulse, 60 to 65.

May 25—Vomiting, nausea. Hearing good. Eye grounds normal. No disturbances of equilibrium.

May 29—Restless and stuporous. Legs flexed. Lies on side of lesion. Headache. Facial paresis, right. Slight nystagmus to right on looking to right. Reflexes exaggerated, especially on right. Right arm shows incoordination. Left arm normal. Walking is impossible. Falls to side of lesion. Cerebrospinal fluid contains a few lymphocytes and polynuclears. Caloric negative on affected side.

Second operation. Incision of cerebellum; pus. Improvement. Healed without incident.

Case 22. Dortu, P.[26]—Male, aged eleven years. Admitted May 25, 1908. A week ago, chill followed by sweat, and pain in left ear and discharge. Four days later, another chill, and pain extended to half the head. Vertigo, nausea and vomiting. Head is bent to left shoulder. Emaciation. Large granulation in left canal. Left facial paralysis. Deviates to side of lesion. Pulse, 100; temperature, 36.7° C. No hearing in left ear. Lumbar puncture shows normal fluid.

May 26—Operation.

May 28—Pulse, 54; temperature, 36.4° C. Rigidity of neck. Paresis of left arm and leg. Increased knee jerk.

May 29—Second operation. Cerebellum incised. Negative. Next day, exitus.

Postmortem—Posterior surface of petrosa, behind internal auditory meatus, shows greenish discoloration. A little pus under dura at this point. Lateral ventricles dilated. Fluid clear. Abscess in left lobe of cerebellum. Fistula in external semicircular canal. Pus in entire labyrinth.

Case 23. Dougherty, D. S.[27]—Female, aged nineteen years. Seen November 8, 1908. Otitis media suppurativa chronica, left, for ten years. A week before, earache, vertigo, chill, and nausea. Temperature, 104° F.; pulse, 140. Mastoid tenderness. Slight nystagmus.

Mastoid operation. Perforation in bony wall over sinus. Sinus wall gangrenous and perforated. Contained clot. Clot removed.

November 15—Restlessness, chills and headache. Temperature, 101.8° F.; pulse, 76. Jugular resection.

November 21—Temporosphenoidal lobe incised; negative. Cerebellum incised; pus.

November 28—Collapse. A portion of occipital bone removed, and through and through drainage instituted. Recovery.

Case 24. Dougherty, D. S.[27]—Male, aged fifty years. Otitis media suppurativa chronica, right. For two weeks, earache. For one week, facial paresis. Admitted July 27th.

August 5—Chill. Temperature, 103.4° F. Vertigo and nausea.

August 6—Radical mastoid. Sinus incised. Clot evacuated.

September 7—Chill and nausea. Vertigo. Nystagmus to left. Neuroretinitis. Spinal fluid normal. Temporosphenoidal lobe incised; negative. Cerebellum incised; pus. Recovery.

Case 25. Forgue, E., and Rauzier, G.[28]—Male, aged twenty-four years. Admitted October 21, 1911. Otitis media suppurativa chronica, left. Pain in left ear for ten days, and headache and vertigo. On admission, temperature, 39.2° C.; pulse, 68. Mastoid tenderness. Vomiting.

October 26—Lumbar puncture. Cloudy fluid. Numerous leucocytes. Sterile.

October 31—Exitus.

Postmortem—Cerebellar abscess in left hemisphere. On posterior surface of petrosa, dura is thickened. Mastoid full of pus. Fistula leading to posterior surface of petrosa.

Case 26. Glegg, W.[29]—Male, aged thirty-three years. Otitis media suppurativa chronica, right. Polyp removed. Admitted end of November, 1911. Pain in right ear for a week, with vomiting. Temperature, 100°; pulse, 108. Vestibular reaction present on both sides, but less readily induced on right side. Right optic neuritis. Paresis of right sixth nerve. Next day, radical mastoid. Sinus injured. Four days later, jugular

ligation. Sinus opened and white thrombus removed. Deep extradural abscess in posterior fossa opened. Knee jerks slightly increased. Spontaneous nystagmus on looking to right.

December 22—Cerebellum and temporosphenoidal lobes explored. No pus found. Exitus.

Postmortem—Abscess in middle lobe of cerebellum. A second abscess in right temporosphenoidal lobe, immediately adjacent to the cerebellar abscess. The tentorium between was intact.

Case 27. Hibler, E.[32]—Male, aged forty-nine years. Admitted January 23, 1909. Otitis media suppurativa acuta (?), right, for ten weeks. For five weeks, pain. Two days, vertigo and tendency to fall to the right. For ten days, facial paralysis, right. Marked horizontal nystagmus to the right. Slight nystagmus to left. Granuloma in right canal. Somnolence. Pulse, 60. Death, January 24th.

Postmortem—Abscess in right cerebellar hemisphere. Purulent lepto- and pachymeningitis. Osteitis and periostitis of right temporal bone, combined with carcinomatosis. Thrombosis of right sigmoid sinus.

Case 28. Isemer, F.[33]—Male, aged thirty-nine years. Admitted March 15, 1907. Otitis media suppurativa chronica, right. Two weeks ago, earache, right, and vomiting. Day before admission, vertigo and slight facial paresis, right. Nausea. Right side of occiput and back of neck sensitive. Eye grounds normal. Marked nystagmus, especially on looking to right. Knee jerk lost on right side, slight on left. Standing with eyes closed, sways to right and backward. Heard loud voice, right; Weber to left. Temperature, 37.5° C.; pulse, 82.

March 15—Radical mastoid. Cholesteatoma. Sinus covered with granulations. Fistula in external semicircular canal.

March 17—Diplopia. Paresis of internal rectus and obliquus.

March 18—Increased headache.

March 19—Sensorium cloudy. Pulse, 64. Cerebellum incised; pus.

March 22—Chills. Temperature, 39.2° C. Jugular ligation. Sinus incised; clot.

March 25—Optic neuritis.

April 1—Erysipelas starting from nose.

April 3—Deviation conjugee.

April 11—Exitus.

Postmortem—Large abscess in right cerebellar hemisphere, surrounded by encephalitis. Broken down thrombus in right lateral sinus. Pus in jugular bulb. Fistula in promontory. Stapes is present. On removing it, pus flows out of oval window. Facial exposed. No pus in internal auditory meatus. Small abscess in region of saccus. Outlet of aqueductus vestibuli is enlarged and blackish.

Microscopic examination shows cochlea and vestibule entirely destroyed. Aqueductus vestibuli is dilated (more than one millimeter) and full of pus. Saccus cannot be found.

Case 29. Jacques, P., and Goulet, G.[34]—Male, aged forty years. Admitted February 17, 1910, with grippal otitis, right, for three weeks. Temperature, 41.2° C. Rapid pulse. Vertigo, chills, headache. Semisomnolence. Facial paresis, right, and spontaneous horizontal nystagmus. Right ear contains polypi. Slight mastoid tenderness. Complete deafness, right.

Radical mastoid operation. Cholesteatoma. Small fistula in ampulla of external semicircular canal. Small fistula in facial canal, behind and above oval window. Lumbar puncture showed clear fluid.

February 19—Chill. Temperature, 40° C. Nystagmus reappeared.

February 20—Exposed portion of sinus wall is gangrenous. Incised. Pus and clot.

February 21—Vertigo.

February 22—Headache. Temperature, 40° C. Cerebellum incised; no pus.

February 23—Exitus.

Postmortem—Abscess in inferior portion of right cerebellar hemisphere.

Case 30. Karsner, H. T.[35]—Male, aged sixty years. November 1, 1910, noticed that in walking his body bent to right, and he had tendency to turn to right. Pain in occiput and back of neck. Coordination in movements of hand was poor. Knee jerks exaggerated. Ankle clonus. Grip weaker in right than in left hand. Slight slowing of pulse. No temperature. Death, November 16th.

Postmortem—Gangrene at base of right lung. Middle lobe of cerebellum contained large abscess. Pus showed pure culture of staphylococcus cereus albus. Lung showed same organism.

Case 31. Kelson, W. H.[36]—Female, aged forty-three years. Operated February 2, 1910, for nasal polypi.

February 7—Otitis media suppurativa acuta, left.

March 1—Temperature, 100.5° F.; pulse, 78. Wasted. Drowsy. Vertigo. Left pupil larger than right. Both reacted. Coarse slow nystagmus to left seen on one occasion. Pus and granulations in left ear. Has hearing. Knee jerk more marked on left. Vomiting, headache. Prefers to lie in flexed position, on right side. Constipation. Positive caloric, left. Limbs of left side weaker than right.

March 3—Cerebellum explored. Abscess found in left hemisphere. Contained streptococci.

March 28—Exitus.

Postmortem—Showed abscess surrounded by edema, and a small abscess on dorsal surface of left cerebellar hemisphere.

Case 32. Kerrison, P. D.[37]—Female, aged sixteen years. Otitis media suppurativa chronica, both ears. First seen February 9, 1910. Acute mastoiditis, right. Temperature, 100.4° F. Dizzy for three or four days.

Operation, February 9. Perisinus abscess.

February 14—Headache and vertigo. Slight rotatory nystagmus in lateral positions.

February 20—Negative caloric. Good hearing.

February 23—Frontal headache. Vertigo, vomiting. Nystagmus to right more marked. Falls to right. Falling not influenced by position of head. Hypermetria, right. Speech thick. Adiadokokinesis, right. Left wrist rotates four times while right wrist rotates once.

March 3—Eye grounds normal.

March 6—Second operation. Cerebellum behind sinus; pus.

May 10—Discharged cured.

Case 33. Kirmisson, M. E.[38]—Male, aged eleven and one-half years. Admitted January 13, 1902. Otitis media suppurativa chronica, right. Fistula over mastoid, right, following an abscess incised two weeks before. Purulent discharge from ear. Prostration, headache, constipation. Pulse, 98; temperature, 37.2° C. Vomiting.

January 15—Mastoid operation. Hyperesthesia. Weakness of all four limbs. Vertigo. Objects turn from his left to his right. Knee jerks lost. Kernig.

January 20—Temporosphenoidal lobe incised; nothing found. Cerebellum incised; pus.

March 24—Cure. Pus from abscess showed colon bacillus.

Case 34. Knapp, A.[39]—Male, aged twelve years. Otitis media suppurativa chronica, right, two and one-half weeks before admission; subperiosteal abscess was opened. Seen March 27, 1906. Drowsy, pupils dilated, optic neuritis. No hearing, right. Temperature, normal; pulse, 55. Rigidity of neck. Lumbar puncture showed cloudy fluid. Mastoid operation; cholesteatoma. Temporosphenoidal lobe incised; no pus. Deep epidural abscess in posterior fossa. Opening in dura. Opening enlarged. Large abscess in cerebellum. Respiration very bad during operation. On evacuating abscess, breathing improved. Exitus a week later.

Postmortem—Purulent exudate over base of brain, covering optic chiasm, and extending back into spinal cord. Abscess cavity in anterior part of right cerebellar hemisphere. Lateral ventricles dilated, and contain turbid fluid. External semicircular canal destroyed by cholesteatoma. Streptococci in spinal fluid.

Case 35. Labouré, J.[41]—Male, aged twenty-three years. First seen July 13, 1910. Fifteen days before, headache. Vomited two or three times. Vertigo. In left ear, cicatrices in membrana tympani, and small perforation with a little mucopus. Temperature, 38° C. No mastoid tenderness. Negative Rinné, left. Weber uncertain. Simple mastoid operation. Cells contain pus. Posteroinferior wall of antrum is sequestrated.

Patient lies on left side, holding his head in his hands. Mentality clear. Memory good. Answers questions slowly. Spontaneous nystagmus to diseased side. With noise apparatus in right ear there is some hearing in left ear. Rotation to right gave only two nystagmic movements to left. When he walks he drags his left leg and deviates to left; more so the longer he walks. When he is still he spreads his legs apart, enlarging his base of support. He can stand with his eyes closed, but loses his equilibrium during rotation. Jumping forward or backward is absolutely impossible. Muscular power diminished on left side. Diagnosis of cerebellar lesion is made, with or without a labyrinthitis.

July 25—Second operation. Epidural abscess found over cerebellum. Large hole in dura leading into cerebellum. Cortical cerebellar abscess. After operation, nystagmus persisted.

Left pupil dilated. Ptosis, left. Divergent strabismus. Third nerve paresis, left. Patellar reflex exaggerated. Slight rigidity of neck and slight Kernig. No Babinski. Lumbar puncture showed clear fluid. The pus from the cerebellar abscess contains only scattered Gram positive intracellular cocci. Cerebrospinal fluid showed a few white and red cells; no organisms. The ocular paralysis and nystagmus gradually disappeared. Patient discharged in a month.

Case 36. Lannois, M.[42]—Male, aged thirty-nine years. Otitis media suppurativa chronica, right, since seven years of age. One month ago vertigo, which caused him to fall, without losing consciousness. Vomited two days. For past twelve days facial paresis, right. Spontaneous nystagmus to both sides, most marked to left. Not modified by caloric in right ear. Temperature around 38° C. Labyrinthine operation had no effect on symptoms. Two weeks later, paresis of right abducens. Trephining and puncture over cerebrum and cerebellum; no pus found. Autopsy showed a double abscess in cerebellum, which was not reached, on account of its situation high up and in front.

Case 37. Laurens, P.[43]—Male, aged twenty-one years. Admitted January 18, 1909. Otitis media suppurativa chronica, left, since infancy. For past week, violent headache, left. Vertigo, vomiting. Temperature, 39.7° C.; pulse, 72. Knee jerks diminished. Mastoid tenderness. Diminished Schwabach. Weber to right. Slight spontaneous nystagmus to sound side. Caloric positive. Cerebrospinal fluid was under normal pressure; a trifle cloudy; contained lymphocytes and polynuclears, but no bacteria.

January 21—Radical mastoid.

January 27—Epileptoid attack.

January 28—Temperature, 36° C.; pulse, 60. Torpor. Nystagmus to diseased side, in addition to nystagmus to sound side. Exitus.

Postmortem—Meninges normal, except on posterior surface of petrosa, where there are adhesions between dura and pia. Dilatation of lateral ventricles. Abscess in left lobe of cerebellum. The portion of the petrosa between labyrinth and sinus, corresponding to inner antral wall, is diseased.

Case 38. Laurens, P.[43]—Female, aged nineteen years. Admitted in comatose condition. Rigidity of neck. Kernig. Cuta-

neous hyperesthesia. Photophobia. Inequality of pupils. Exaggerated knee jerks. No nystagmus. Temperature, 38° C.; pulse, 54. Otitis media suppurativa chronica, right. Cerebrospinal fluid cloudy; contains polynuclears and anaerobic bacteria. Exitus twelve hours later.

Postmortem—Meninges normal, except on posterior surface of petrosa. In right lobe of cerebellum an abscess. Spinal canal full of pus. Disease in inner wall of antrum between labyrinth and sinus.

Case 39. McBride, P.[44]—Male, aged twenty-three years. Seen October 14, 1907, Otitis media suppurativa chronica, right. Four days before, pain. Edema over mastoid. Temperature, normal; pulse, 84. Right ear deaf.

Seen again January 14, 1908. Vertigo for two weeks. Vomiting. Nystagmus on looking to the right.

January 16—Radical mastoid.

February 5—Incised lateral sinus; clot. Drowsiness.

February 17—Nystagmus on looking to the left. Exploration of cerebellum and temporosphenoidal lobe; no pus. Symptoms improved.

March 1—Again explored; no pus.

March 7—Abscess found in cerebellum. Recovery.

Case 40. Mathewson, G. H.[46]—Male, aged nineteen years. Seen March 14, 1912. Otitis media suppurativa chronica, left. On February 23d, headache and vomiting. Apathy. On looking to right, marked nystagmus. Vertigo. Pupils dilated.

March 16—Operation; cholesteatoma. Inner table gone over sinus and cerebellum. Hole in cerebellar dura, from which pus was oozing. Opening enlarged and large cerebellar abscess evaculated. Cure.

Case 41. Michaelsen, U.[47]—Female, aged forty-three years. Polyp removed from right ear. Next day, headache, drowsiness, vertigo, nausea. Right ear, no bone conduction. Negative Rinné. Watch is not heard. Positive caloric.

November 26, 1909—Radical mastoid. No stapes. Probe passes easily into vestibule. On probing downward and backward the eyes move downward. On probing backward the eyes deviate to the diseased side. On probing upward the eyes deviate upward. On probing forward there is no movement of eyes. Labyrinth operation.

November 26—Vomiting. Marked escape of cerebrospinal fluid. Rotatory nystagmus to left. Temperature, 37.2° C.

November 27—Apathy. Pulse slow. Slight rigidity of neck. Lumbar puncture shows turbid fluid. Resection of remainder of posterior surface of petrosa; no pus. Internal auditory meatus opened.

November 29—Vomiting. No nystagmus. Pulse slow.

December 4—Right facial paralysis.

December 11—Cerebellum aspirated; pus found. Incision. Evacuation of one and one-half ounces of pus.

January 4, 1910—Patient discharged cured. Completely deaf, right.

Case 42. Michaelsen, U.[47]—Male, aged forty-three years. Otitis media suppurativa chronica, right. Has bone conduction. Weber to right. Rinné negative. Watch heard at seven centimeters. Marked nystagmus to sound side. On irrigating with cold water, violent dizziness.

December 9, 1909—Radical mastoid operation; cholesteatoma in antrum. Small fistula in ampullated end of external semicircular canal. On introducing probe, movement of eyeballs.

January 29, 1910—Readmitted with headache, vertigo and vomiting. Tinnitus. Nystagmus to left. Has bone conduction. Watch is heard at nine centimeters.

February 1, 1910—Labyrinth operation; cerebellar abscess found. Lumbar puncture shows turbid fluid. Exitus.

Postmortem—Purulent leptomeningitis. Walnut-sized abscess in right cerebellar hemisphere. Recent thrombus in right lateral sinus. Puncture into cerebellar abscess entered lateral ventricle, which was dilated. There was a circumscribed labyrinthitis, which caused infection through ductus endolymphaticus to saccus. This led to cerebellar abscess. Cochlea was not involved.

Case 43. Michaelsen, U.[47]—Male, aged fifteen years. Right, tenderness over mastoid. Canal full of pus and granulations. No bone conduction. Rinné negative. Optic nerves somewhat blurred.

June 25, 1910—Radical mastoid operation; cholesteatoma. Fistula in ampullated end of external semicircular canal. Perisinus abscess. Fistula in wall of sinus. Jugular ligation. Lateral wall of sinus excised. On passing probe into fistula in

external semicircular canal, no movements of eyes. Exposure of cerebellar dura beyond saccus. Vestibule opened. Internal auditory canal opened.

June 26—Vomiting. Pulse, 50. No temperature. Somnolence.

June 30—Puncture of cerebellum; pus. Incision and drainage of a superficial abscess.

July 8—Headache. Lumbar puncture shows clear fluid. Puncture of cerebellum discloses no pus. Choked discs increased.

July 16—Exitus.

Postmortem—Purulent leptomeningitis. Encephalitis, especially of cerebellum, probably starting from saccus.

Case 44. Michaelsen, U.[47]—Male, aged thirty-two years. Otitis media suppurativa chronica, both. Two weeks ago, headache and vertigo. Had polyp removed from ear. Headache worse. Left facial paresis and mydriasis. Reflexes increased. On walking, deviation to the right. With Romberg, falls to right and backward. Bilateral radical mastoid; labyrinth operation, left. Large fistula in ampullated end of external semicircular canal. On probing, no movement of eyes. Exudate in vestibule. Dura of posterior fossa normal. No escape of liquor on opening internal auditory meatus. Facial exposed in horizontal portion. Lumbar puncture shows clear fluid; no pressure. Vomiting. Headache improved. Somnolence. Incision of cerebellum; pus; drainage. Three days later, marked optic neuritis, right. Left, slight changes in disc. Puncture of right temporosphenoidal lobe. At depth of three and one-half centimeters, turbid liquor, which evidently comes from lateral ventricle. Incision. Glass drain. Enormous flow of liquor. Next day, exitus.

Postmortem—Suppuration in left labyrinth, extending to dura and pia of posterior fossa. Abscess in left cerebellar hemisphere. Internal hydrocephalus.

Case 45. Michaelsen, U.[47]—Female, aged thirty-four years. Otitis media suppurativa chronica, left. Five weeks ago, ear dry. Since then, pain. Five days ago, facial paralysis, left. Four days ago polyp removed from ear. Left ear deaf. Spontaneous nystagmus in both directions. Caloric reaction positive.

Radical mastoid, left. Fistula in external semicircular ca-

nal. On probing, eyes deviate to opposite side. Two weeks later, vomiting. Increased nystagmus. Temperature, normal. Headache. Apathy. Next day, exitus.

Postmortem—Beginning meningitis. Abscess in left cerebellar hemisphere. Hydrocephalus internus.

Case 46. Milligan, W.[48]—Male, aged twenty-four years. Otitis media suppurativa chronica, right, for eighteen years. Three weeks before admission, headache and vomiting. Vertigo and constipation. Drowsiness. Temperature, 97°; pulse, 56. Weber to right. Nystagmus to right. Optic neuritis. Kernig. Adiadokokinesis. Cerebrospinal fluid clear and under tension.

Operation. Radical mastoid. Cerebellum explored; pus. Recovery.

Case 47. Milligan, W.[48]—Female, aged twenty years. Otitis media suppurativa chronica, right. Three weeks ago, headache and vomiting. Constipation. Coma. Temperature, 97°; pulse, 60. Nystagmus to right. Optic neuritis. Kernig. Cerebrospinal fluid clear.

Operation. Radical mastoid. Cerebellum explored; pus. Recovery.

Case 48. Mithoefer, W.[49]—Female, aged eleven years. Otitis media suppurativa chronica following measles, four years ago. On March 13, 1910, chill, fever and earache. Three days later, seen by writer. Small amount of foul pus. Perforation in Shrapnell's. Temperature, 101°; pulse, 80. Headache and vomiting. Mastoid tenderness. No spontaneous nystagmus. Caloric positive. Next day, operation. Perisinus abscess. Sinus incised. Fifteen hours later, sudden cessation of respiration. Artificial respiration. Cerebellar dura in front of sinus incised and pus evacuated. Death.

Case 49. Mithoefer, W.[49]—Male, aged twenty-one years. Otitis media suppurativa chronica. Occasional earache. In December, 1908, pain was intense. Also chills and fever, and sweats. Tenderness over both mastoids.

Operation. Mastoid contained pus. Wall of sinus thick and gangrenous. Sinus incised. Free bleeding. Four weeks later, dizziness, nausea and vomiting. Had hearing. Temperature, 99.4° F; pulse, 56. Nystagmus to diseased side. Ataxia. Projectile vomiting. Inclination of head to diseased side. Optic neuritis both.

Operation. Cerebellar dura behind sinus incised; pus. Six days later, death, with signs of meningitis.

Case 50. Morton, J. P.[50]—Female, aged fifteen years. Mastoiditis, right. Temperature, 105° F. Mastoid operation. Three days later, temperature, 99°. Mental torpor. Patient lay on left side. No nystagmus. Right arm weaker than left. Vertigo. Tendency to fall. Exaggerated reflexes, right. Operation showed large cerebellar abscess. Meningitis. Exitus.

Case 51. Neumann, H.[52]—Male, aged thirty-five years. Otitis media suppurativa chronica, both, since childhood. Hearing in both ears, less in left. Weber to right. Radical mastoid, left. Dura in roof of antrum exposed; cholesteatoma in antrum. Prominence of external semicircular canal shows a black spot. Next day, April 7th, vertigo.

April 10—Headache. Temperature, 38.7° C. Improvement after changing dressing.

April 25—Headache, vertigo, fever. Pupils small and sluggish. Right optic neuritis. Rotatory nystagmus to left, especially on looking toward operated side. Diplopia, due to paresis of left sixth nerve.

April 26—Operation. External semicircular canal opened. Labyrinth contains pus. Nystagmus has changed. Is most marked on looking toward the right, and is almost horizontal. On looking to left, slight horizontal nystagmus to left. Somnolence. Headache.

May 4—Exitus.

Postmortem—Left sided cerebellar abscess. Suppurative labyrinthitis.

Case 52. Neumann, H.[52]—Female, aged thirty-four years. Otitis media suppurativa chronica, left. Six weeks ago, earache and deafness. Three weeks ago, headache. Polyp removed from left ear, followed by vertigo and diplopia, vomiting and unsteady gait. Objects seem to move to right. On examination, pulse 114. Intense headache. Head is turned to left. No rigidity of neck. Rotatory nystagmus to left, increased on looking to left, along with horizontal nystagmus to left. Left facial paresis. All reflexes increased. On standing with closed eyes, falls to right and backward. On rotating head, no difference. Walk unsteady. Left middle ear full of polypi. Pressure on polypi causes no dizziness. Weber to right. Rinné negative, left. No bone conduction.

May 14—Fetor ex ore. Vomiting. Operation. External semicircular canal rough. Sinus injured.

May 18—Rotatory nystagmus to left on looking to left. On looking to right, horizontal nystagmus to right.

March 23—Vomiting. Intense left-sided headache. Increased patellar reflex, both. Ankle clonus, left. Some rigidity of neck. Pulse, 132; respiration, 40. Lumbar puncture showed fluid under increased pressure, and turbid.

Operation. Exposure of cerebellar dura in front of sinus. A few drops of thick pus appear. Posterior surface of petrosa, including static labyrinth, removed. Pus in vestibule. Dura in region of saccus covered with granulations. Cerebellum incised in front of sinus; no pus. Sinus incised; no bleeding.

May 25—Vomiting. Pain in back of neck. Pulse, 84. Vertigo when lying on right side.

May 27—Exitus.

Postmortem—Abscess in left cerebellar hemisphere.

Case 53.—Neumann, H.[52]—Male, aged forty-five years. Otitis media suppurativa chronica, left, two and one-half years. For two days, intense headache, fever and chills. Vertigo for six weeks. Rotatory nystagmus to right, especially on looking to the right. Temperature, 39.8° C.; pulse, 102. Weber to right. Hears voice at one meter, left. Bone conduction diminished. Lumbar puncture; clear fluid; sterile. Radical mastoid operation. Large fistula in external semicircular canal. Perisinus abscess. Sinus thrombosed. Labyrinth opened; contained black masses. Sinus opened. Jugular ligated.

January 25—Facial paralysis, left. Nystagmus somewhat less.

February 3—Intense headache. On looking to right, nystagmus to right, as before. On looking to left, slight horizontal nystagmus.

February 4—Pulse, 69. Nystagmus has changed. It is most marked on looking to left, and is directed to left. Vomiting.

Operation. Removal of posterior surface of petrosa up to internal auditory meatus. Deep epidural abscess. Dura is sofe. Cerebellum incised in front of sinus; pus.

March 2—Operation. Incision through inner sinus wall. Second abscess found behind first.

March 13—Much improved.

March 31—Cured.

Case 54. Neumann, H.[52]—Female, aged twenty years. Admitted March 8, 1905. Otitis media suppurativa chronica, left, since seven years of age. Had operation on ear a year later. Since end of January, pain in left ear and profuse discharge. Since beginning of February, fever. On admission, fistula in mastoid. Weber to left. Rinné negative. Bone conduction diminished.

Operation. Radical mastoid; cholesteatoma. Dura of posterior fossa covered with granulations. Deep extradural abscess over posterior surface of petrosa. Cerebellum incised; pus. Sinus incised; thrombus. After operation, nystagmus to left only on looking to left. Vertigo.

March 11—On looking to left, nystagmus to left. On looking to right, very slight nystagmus to right. Empyema.

March 18—Exitus.

Postmortem—Abscess in left cerebellar hemisphere. Pial edema. Thrombophlebitis of left lateral sinus. Serofibrinous pleurisy, left. Compression of lung.

Case 55. Neumann, H.[52]—Male, aged seventeen years. Admitted April 27, 1905. Otitis media suppurativa chronica, right. Four years ago, fistula over mastoid, which healed. Four weeks ago, swelling over right mastoid. Headache. Emaciation. Vertigo. Vomiting. Speech is difficult. Tremor of right hand. Difficulty in walking. Arms and legs paretic and ataxic. No nystagmus. Neck tender. Scanning speech. Pulse, 60. Weber to left. Right Rinné negative. Air conduction much shortened.

Operation. Radical mastoid. Sinus exposed; cholesteatoma. Deep extradural abscess. Fistula in dura. Abscess in cerebellar hemisphere. Posterior part of labyrinth opened. Cochlea opened. After operation, no vomiting, no nystagmus. Facial paralysis, right.

April 28—Conjugate paralysis, right and upward. Headache. Patient lies always on left side.

May 2—Second abscess incised, followed by rotatory nystagmus to right.

Case 56. Neumann, H.[52]—Female, aged thirty-two years. Admitted April 2, 1901. Otitis media suppurativa chronica, right, eighteen years. For three weeks, earache. For one week, facial paralysis, right. Weber to right. Rinné negative, right. Hears whisper, right, at three meters.

April 3—Radical mastoid.

April 10—Headache. Irritability. Vertigo. Falls backward. Pulse, 64. Slight strabismus. Marked nystagmus, especially on looking to right. Reflexes increased. Ankle clonus. Eye grounds normal. Exitus in evening.

Postmortem—Old abscess in right cerebellar hemisphere. Pigmentation around abscess. Hole in dura, over region of ductus endolymphaticus. Deep epidural abscess of posterior fossa. Edema of brain. Acute hydrocephalus.

Case 57. Nourse, C.[53]—Male, aged six years. Otitis media suppurativa chronica, both, of eight months' duration. Pain in left ear five days. Headache. Vomiting. Mastoid tenderness. Mastoid operation. Perisinus abscess. Improvement. Sixteen days later, vomiting and headache. Temperature, 100° F. Drowsiness. Retraction of head. Exitus three days later.

Postmortem—Abscess in left lobe of cerebellum.

Case 58. Paterson, D. R.[54]—Female, aged fourteen years. Admitted February 27, 1907. Otitis media suppurativa chronica, left, following scarlet fever. Nine days before admission, headache. Temperature, 104°; pulse, 120. Right optic neuritis.

Operation. Cholesteatoma. Dura of middle fossa normal. Sinus apparently healthy.

March 13—Second operation. Cerebellum incised; pus. Cure.

Case 59. Paterson, D. R.[54]—Male, aged eighteen years. Admitted April 20, 1907. Five weeks before, pain in right ear. Headache. Vomiting. Diplopia. Drowsy. Temperature, subnormal; pulse, 54. Fetid discharge from right ear. Granulations. Nystagmus to both sides. Weakness of left external rectus. Double optic neuritis.

April 21—Operation. Cholesteatoma. Cerebellum and sinus uncovered. Cerebellum incised; pus. Cure.

Case 60. Paterson, D. R.[54]—Male, aged eleven years. Admitted March 21, 1907. Pain in left ear, headache, nausea and vomiting. Slight optic neuritis. Left membrana tympani red and bulging. No discharge.

April 4—Operation. Sinus in posterior part of bone, toward occiput, leading to fistula in dura. Incised. Cerebellar abscess found.

June 15—Discharged cured.

Case 61. Pierce, N. H.[55]—Female, aged twenty years. Seen February 7, 1909. Pain in right mastoid. Right facial paralysis. Earache began four weeks ago. Seven years ago, earache, right, and off and on since. Temperature, 99.5° F. Nystagmus to sound side. Vomiting. Neck rigid. Slight hearing, right. Answers slowly. Pulse, 60. Right disc blurred. Caloric negative. Labyrinthogenic cerebellar abscess was diagnosed.

Operation. Cholesteatoma. Fistula in external semicircular canal. Labyrinth opened. Cerebellar dura normal. Cerebellum explored behind sinus. Incision; pus. Hemiparesis of affected side was present after operation. It may have been there before operation. Cure.

Case 62. Rauzier and Roger.[56]—Male, aged twenty-four years. Admitted October 21, 1911. Otitis media suppurativa chronica, left. Headache, constipation, vertigo. Temperature, 39.2° C.; pulse, 68. Vomiting. Torpor. Lumbar puncture; cloudy fluid; sterile; under tension. Exitus.

Postmortem—Abscess in left cerebellar hemisphere. Mastoid full of pus.

Case 63. Rawling, L. B.[57]—Male, aged twenty-one years. Admitted December 1, 1905. Otitis media suppurativa acuta, left, four months. Three weeks ago, earache. Two weeks ago, frontal headache. Facial paralysis, left. Sways to left when standing with eyes shut. Temperature, 101° F.; pulse, 80.

December 5—Optic neuritis. Drowsiness.

December 7—Operation. Cholesteatoma. Improvement. Pulse, 64 to 88.

December 14—Trephine over cerebellum. Cerebellum incised; pus. Headache disappeared.

January 30—Discharged cured.

Case 64. Richards, J. D.[58]—Male, aged twenty-five years. Otitis media suppurativa chronica, left. On July 3, 1906. Schwartze-Stacke operation was done for the relief of otorrhea. Necrosis of tegmen tympani and posterior antral wall. Adjacent dura thickened and inflamed. On August 1, severe headache. Dizziness and vomiting. Tendency to fall to opposite side. Temperature, 97.8° F.; pulse, 50. Constipation. Reoperated. Epidural abscess above sinus knee evacuated. Next day, headache almost disappeared.

August 4—Papillitis. Next day, drowsiness and irrita-

bility. Answers delayed. Headache. Nausea. Emaciation. Temperature, 102.6° F.; pulse, 72 to 140. Horizontal nystagmus in both directions. Uvula deviates to right. Complete left facial paralysis came on a week after original operation. Sense of taste in anterior two-thirds of left half of tongue gone. Marked incoordination.

Operation. Incision through cerebellar dura one inch behind upper third of sinus; no pus. Incision internal to sinus, corresponding to posterior antral wall, going back one-half inch, evacuated large quantity of pus. Counter drainage from behind sinus. Recovery.

Case 65. Rutherford, H.[61]—Male, aged fourteen years. Headache and dizziness. Pulse, 52 to 62. Apathetic. Dusky and livid. Radical mastoid operation. Six days later, death from respiratory failure.

Postmortem—Cerebellar abscess. Granulation tissue around eighth nerve.

Case 66. Ruttin, E.[62]—Male, aged eighteen years. Admitted November 4, 1908. Periodic otorrhea, left, for eight years. Three to four weeks, pain and vertigo. Granulations and cholesteatoma, left. Has hearing. Weber to right. Rinné negative. Bone conduction shortened. No spontaneous nystagmus. On bending the head backward, nystagmus to right. Reversed fistula symptom. Caloric reaction positive. Temperature, normal.

November 10—Radical mastoid operation. Fistula in external semicircular canal. Next day, temperature 38° C. Headache. Nystagmus to sound side. Some rigidity of neck. Total deafness. Caloric negative.

November 13—Labyrinth operation. Escape of liquor. In the next six days, diminution of temperature. Pulse, 100. Nystagmus to sound side. On the seventh day, headache, slight nystagmus to diseased side, and vomiting. Temperature, normal; pulse, 70.

November 22—Nystagmus to left. Lumbar puncture; fluid clear. Pulse, 68. Cerebellum incised in region of posterior petrosal surface; pus.

November 21—Exitus.

Postmortem—Abscess in left cerebellar hemisphere, surrounded by edematous area. Hemorrhagic encephalitis. No meningitis. Pus showed streptococci.

Case 67. Ruttin, E.[62]—Male, aged sixty-eight years. Repeated otorrhea, left, for twenty years. Five months ago, swelling behind left ear. For two weeks, vertigo. Since day before, vomiting and headache. Has hearing. Nystagmus sometimes to right, sometimes to left. Slight fistula symptom. Caloric nystagmus lasts long time. Temperature, normal. Five days later, October 20, radical mastoid operation. Perisinus abscess. No fistula could be found in the labyrinthine capsule.

October 22—Marked nystagmus to right. Patient lies on right side. Completely deaf in left ear. Caloric positive. Vertigo.

October 25—Nystagmus to left. Ataxic gait. Vertigo. Eye grounds normal.

October 27—Sudden unconsciousness. Slight contractions of right hand. Pupils small; and do not react. Temperature, normal; pulse, 120.

October 27—Labyrinth operation, without narcosis. Incision of cerebellum over posterior petrosal surface; pus. Counter opening behind sinus. Conscious an hour later. No nystagmus. Five hours later, rotatory nystagmus to right. Babinski, left. Ataxia of left extremities.

October 29—Coma. Deviation of eyes to left. Cerebrospinal fluid cloudy.

October 30—Exitus.

Postmortem—Diffuse purulent meningitis. Cerebellar abscess, left. Streptococcus mucosus in cerebrospinal fluid and abscess.

Case 68. Ruttin, E.[62]—Male, aged eighteen years. Otitis media suppurativa chronica, left, following measles. Two weeks before, pain in ear.

February 11, 1910—Radical operation. Dura and sinus normal.

February 12—Temperature, 38.3° C. Vertigo. Nystagmus of first degree to sound side. Has hearing. Caloric negative.

February 21—Discharged.

February 23—Readmitted. Headache. Eye grounds normal. Temperature, 37.8° C. Labyrinth operation. Cerebellar dura near vestibule is discolored. Incision of cerebellum is negative.

February 25—Horizontal nystagmus to sound side. Rota-

tory nystagmus to diseased side. Vertical nystagmus on looking upward. Headache. Temperature, 36.7° C. to 37.2° C.; pulse, 68.

February 27—Pulse, 60. Diplopia on looking to left. Incision of cerebellum; pus.

March 13—Exitus.

Postmortem—Hemorrhagic abscess of left cerebellar hemisphere. Circumscribed lepto- and pachymeningitis interna on posterior surface of petrosa. Internal hydrocephalus. Abscess contains streptococcus pyogenes. Fluid in lateral ventricles sterile.

Case 69. Ruttin, E.[62]—Male, aged fifteen years. Admitted December 18, 1909. Otitis media suppurativa chronica, right, for three years. Had polyps removed several times; the last time being three days ago. A week ago, headache. After the polyp extraction, fever and chills. On admission, temperature, 38.4° C. Had vertigo for a long time. Nystagmus to both sides. Right ear is deaf. Rinné negative. Caloric negative. Pulse, 104. Slight rigidity of the neck. Dermographia. Kernig.

December 17—Operation. Pus and cholesteatoma. Perisinus abscess. Dura of middle fossa shows yellowish discoloration. Incision of sinus; thrombus. Jugular ligation. Incision of temporosphenoidal lobe negative. Incision of cerebellum in front of sinus; pus.

December 18—Paralysis of movement of eyes to right. Rotatory nystagmus to left. Slight facial paresis. Rigidity of neck. Knee jerk absent, right. Present on left side. Kernig.

December 19—Rotatory nystagmus to right, and vertical. Eye grounds normal.

December 24—Rotatory nystagmus, right and left. General hyperesthesia. Dermographia. Ataxia of upper and lower extremities.

December 28—No ocular paralyses.

January 4—Completely deaf, right.

January 20—Cured.

Case 70. Ruttin, E.[62]—Male, aged twenty-one years. Admitted July 31, 1910. Otitis media suppurativa chronica, right, ten years. For past eight years attacks of vertigo. For one week headache and vomiting. Right ear deaf. Caloric negative. Slight facial paresis, right. Temperature, 38.5° C.; pulse, 76. Kernig. Eye grounds normal.

July 31—Operation. Cholesteatoma. Fistula in external semicircular canal. Facial exposed in horizontal and descending portions. Stapes missing. Labyrinth operation. Lumbar puncture gives cloudy fluid.

August 1—Rotatory nystagmus, left. Headache.

August 3—Feels better. Pulse, 56.

August 6—No nystagmus. Feels well. Ataxia in both upper extremities, not in lower extremities.

August 10—Headache. Rotatory nystagmus right and left. Apathy. Pulse, 60. Incision of cerebellum, below sinus; pus.

August 11—No nystagmus or headache. Cerebellar pus shows neither pus cells nor bacteria. Sediment consists of detritus.

August 12—Rotatory nystagmus to left and to right.

August 30—Discharged.

October 4—Readmitted. Headache. Vertigo. Pulse, 68. Horizontal nystagmus, right and left.

October 5—Operation. Below first abscess another abscess was found. Contains streptococci and anaerobic bacilli.

October 7—Improvement.

December 21—Discharged cured.

Case 71. Ruttin, E.[92]—Male, aged forty-seven years. Admitted February 8, 1911. Two years ago struck by lightning. Since then deaf in left ear. Three weeks ago, pain and discharge from left ear. Has some hearing. Rinné negative. Bone conduction diminished. No spontaneous nystagmus. Fistula test negative. Rotation, twenty-four seconds, both sides.

February 14—Vomiting and vertigo. Headache. Rotatory nystagmus, right and left. Temperature, normal.

March 7—Operation. Cholesteatoma. Facial lies uncovered. Dura of both fossæ exposed and covered by cholesteatomatous membrane.

March 8—Rotatory nystagmus, right. Facial paralysis.

March 13—Caloric negative. Completely deaf. Rotatory nystagmus, right and left. Bárány's pointing tests typical.

Labyrinth operation. Incision of cerebellum; pus.

March 15—Coma.

March 17—Exitus.

Postmortem—Purulent basilar meningitis. Abscess of left cerebellar hemisphere. Pus from abscess contains staphylococcus pyogenes.

Case 72. Ruttin, E.[62]—Male, aged twenty-three years. Admitted July 1, 1910. Otitis media suppurativa chronica, left, after scarlatina. For two weeks, headache and vertigo. No fever. For two weeks, facial paralysis, left. Has hearing. Rinné negative. Bone conduction increased. No spontaneous nystagmus. Caloric positive.

July 4—Radical operation.

July 7—Vertigo.

July 15—Vomiting. Headache. Temperature, 38° C. Spontaneous nystagmus to both sides. Caloric negative. Rotation test, right thirty seconds; left, nothing. Hearing is questionable.

July 19—Chill. Operation. Stapes absent. Probe falls into oval window without resistance. Labyrinth operation.

July 21—Feels well. Rotatory nystagmus, right and left. Pyemic temperature curve.

July 26—Jugular ligation. Thrombus removed from sinus.

July 29—Edema of right conjunctiva.

July 31—Exophthalmos, right.

August 2—Exitus.

Postmortem—Purulent basilar leptomeningitis interna. Abscess on under surface of left cerebellar hemisphere. Thrombophlebitis of left sigmoid sinus, jugular bulb, inferior petrosal sinus and both cavernous sinuses.

Case 73. Sack, N.[63]—Female, aged five years. Admitted August 31, 1907. Otitis media suppurativa chronica, left, for two years. Two weeks ago facial paralysis, left. Somnolence. Pain in left ear. Temperature, normal; pulse, 115. Vomiting. Horizontal nystagmus to left. Patient falls to left. Ataxic gait.

September 6—Radical mastoid operation. Sequestrum involving part of the cochlea and semicircular canals removed. After operation pulse dropped to 64 to 62. Nystagmus changed to right. Exitus four days later.

Postmortem—Two abscesses in left cerebellar hemisphere. Necrotic area on posterior surface of petrosa, in region of saccus. Pus from abscess showed Vincent's bacillus and spirilla.

Case 74. Savariaud and Dutheitlet de Lamothe.[64]—Male, aged fourteen years. Otitis media suppurativa chronica, right. Admitted March 3, 1911. Headache, vertigo and vomiting. Vomiting is of cerebral type. Apathy. Temperature, 37° C.; pulse, 52. No mastoid symptoms. No Kernig. No rigidity

of neck. Slight inequality of pupils; react normally. Slight papilledema. Walks easily. No asynergy or unmeasured movements. Romberg. On lying down there is some imprecision of movements of right side. No adiadokokinesis. Lumbar puncture shows slightly turbid fluid; sterile

March 4—Operation. Radical mastoid.

March 5—Second operation. Cerebellar dura incised. Cerebellum herniates into wound. Incised; pus. Some improvement. On third day signs of meningitis. Exitus.

Postmortem—Purulent leptomeningitis. Cerebellar abscess. Fistula leading from antrum through posterior surface of petrosa to cerebellum.

Case 75. Scott, S.[66]—Male, aged twenty-eight years. Admitted July 15, 1908. Otitis media suppurativa chronica, left. Headache. Deafness, left, three years and nine months ago. Vertigo, vomiting and headache. Unable to walk straight. Hearing by bone conduction, in left ear, completely lost. Romberg. Falls to right. On walking swerves to right. Spontaneous nystagmus to left. Slight nystagmus to right on looking to right. Eye grounds normal. Kernig. Temperature, 98° F.; pulse, 72. Lumbar puncture showed sterile fluid, not under pressure.

Radical mastoid operation. Large fistula in semicircular canal region. Facial nerve exposed and surrounded by granulations. Granulations in cochlea and vestibule. Labyrinth operation. Granulations on cerebellar dura, mesial to sinus. Incised; pus. Pulse rate became slower—52. Incoordinate movements of left upper extremity.

Second operation. Dural incision enlarged. A large cerebellar hernia formed. Facial paralysis, left. Gradual improvement of symptoms.

Case 76. Spencer, F. R.[67]—Male, aged nineteen years. Seen January 13, 1910. Earache, left, for two days. Otitis media suppurativa chronica since childhood. Mastoid tenderness.

On January 19, simple mastoid operation. Sinus exposed. Was yellow, with no pulsation. Incised, and thrombus removed. Jugular was not tied. Pus had a fecal odor. Patient discharged in three weeks. Four days later, intense pain in left side of head. Sometimes on right side. Vertigo and occasional vomiting, without nausea. Drowsiness. Rapid emaciation. Sallowness. Temporosphenoidal lobe and cerebellum

were explored. No pus found. Death four days later. Pus from mastoid and lateral sinus showed pneumococcus and an organism from the paracolon group.

Postmortem—Cerebellar abscess in left hemisphere.

Case 77. Texier, V.[68]—Male, aged thirty-one years. Admitted February 13, 1908. Otitis media suppurativa chronica, left. Vertigo and vomiting. Tendency to fall to right. Lumbar puncture shows normal fluid. Temperature, normal. Caloric positive. Rotation test normal.

Radical mastoid operation. Some erosion of external semicircular canal, but no fistula. Vertigo and vomiting continued. Headache. External semicircular canal opened; no pus. Ataxic gait. Scanning speech. Cerebellum explored. Patient succumbed to anesthesia.

Postmortem—Large cyst in left cerebellar hemisphere.

Case 78. Thompson, J. A.[70]—Female. Otitis media suppurativa chronica, both. Had hearing. Radical mastoid operation, right. Cholesteatoma.

Postmortem—Suppurative labyrinthitis, right. Extension along auditory nerve. Abscess in right cerebellar hemisphere. Suppurative labyrinthitis, left. Abscess in left cerebellar hemisphere.

Case 79. Thompson, J. A.[70]—Otitis media suppurativa chronica, left, for thirty-five years. Acute exacerbation five weeks ago, with nausea, vomiting, vertigo and intense headache. Temperature, 103° F. Facial paralysis in the fifth week.

Radical mastoid operation. Seven days later cerebellum incised, and abscess found behind internal aditory meatus. Exitus next day.

Case 80. Turner, A. Logan, and Reynolds, F. M.[71]—Male, aged twenty-six years. Otitis media suppurativa chronica, left. Symptoms of sinus thrombosis. Sinus opened and jugular ligated. Cerebellum explored behind sinus. No pus found. Recovery.

Readmitted four months later. Pulse and temperature normal. Pulse under 60 several times. Marked deafness. Weber to right. Schwabach shortened. Spontaneous horizontal nystagmus to right. Caloric negative. Slight Romberg. Cerebrospinal fluid normal.

Second operation. Cholesteatoma. Fifteen days later, vom-

iting. Pulse, 54. At five o'clock in the evening, sudden death.

Postmortem—Large abscess in left lobe of cerebellum. Some edema of brain. No meningitis. Pus showed streptococcus pyogenes and bacillus proteus. Examination of labyrinth showed subacute inflammation with tendency to connective tissue formation. No pus.

Case 81. Uffenorde, W., and Weber, L. W.[72]—Male, aged nineteen years. Otitis media chronica subacute, right, with serous exudate. On July 21st, congestion of membrana tympani on left side. Temperature, 39.5° C.; pulse, 110. Next day some mastoid tenderness and slight rigidity of neck.

July 25—Simple mastoid operation. Pus shows streptococcus. Headache for next two days.

July 28—Radical mastoid operation. Anterior half of external semicircular canal looks blackish. Dura of middle fossa exposed. Looks normal. Next day vomiting. No headache. Temperature, 38° to 39° C. No nystagmus or vertigo.

July 31—Exploration of sinus. On pressing sinus pus exudes from emissary. Ligation of jugular. Sinus split and thrombus removed. Patient felt well until August 16th, when suddenly vision became very poor. Congestion of retinal veins. Counts fingers at two or three meters. Next day, pupils dilated. Marked choked disc, both sides. Star shaped figure in left macule, like in albuminuric retinitis.

August 18—Incision of cerebellar dura evacuated bloody cerebrospinal fluid containing pus. Subcortical cavity in cerebellum. Drainage.

August 23—Macular figure diminishing. Vision, three to four meters.

August 27—Sensorium normal. No ataxia. No disturbances of motility or sensation of upper extremities. Tongue deviates to left. Slight ptosis of left upper lid. Reflexes up.

September 15—Attack of Jacksonian epilepsy, beginning in left leg.

November 4—Discharged cured.

November 5—Examination by Dr. Weber. Tongue deviates to left. Right thigh and leg four centimeters thinner than left. Right foot in varoequinus position. Right side, Babinski. Left patellar and ankle clonus. No vertigo or ataxia. The spastic paresis and Babinski of the right leg indicate a lesion of the left pyramidal tract above the decussation. Deviation

of tongue to left also points to this. Due to inflammation on under surface of left cerebellar hemisphere, causing pressure on pyramidal tract.

Case 82. Uffenorde, W.[73]—Male, seventeen years. Otitis media suppurativa chronica, right. For past ten days, weakness, irritability, and headache. For past week, discharge stopped. Unsteady gait. Tenderness over mastoid. Functional tests, right ear: No bone conduction; Weber is contralateralized; Rinné negative. Left, normal. Gait is uncertain. With eyes closed deviates to right. Temperature, 39.5° C. Irregular nystagmus. Right sided choked disc.

April 10, 1906—Operation. Pus in antrum. Cholesteatoma. Granulations over dura of posterior fossa. Sinus incised; no bleeding. Cerebellum incised; no pus. Improvement in symptoms.

May 1—Plastic.

May 21—Headache, nausea, vomiting, vertigo. Eye grounds normal. Pulse, 80. Falls toward diseased side.

May 25—Temperature, 35.7° to 37.6° C.; pulse, 60 to 68. Babinski both sides. Marked nystagmus toward diseased side. Slight nystagmus toward opposite side.

Operation. Incision of cerebellum; pus. Glass drain.

July 8—Discharged cured.

Case 83. Uffenorde, W.[74]—Male, aged five years. Five weeks ago, scarlet and diphtheria. Four weeks ago, otitis media suppurativa acuta, both. Irregular temperature; vomited twice. Apathy.

April 13, 1909—Operation, left side. Perisinus abscess. Epidural abscess on posterior surface of petrosa. Stapes is wanting. Probe passed into vestibule without obstruction. On withdrawal, pus follows. Fistula in upper part of promontory. Labyrinth operation. Saccus endolymphaticus is plainly seen in dura. It is ruptured.

April 17—Vomiting. Lumbar puncture. Cerebrospinal fluid cloudy. Streptococcus in pure culture. Puncture of cerebellum through inner wall of saccus; pus. Glass drain.

April 21—Exitus.

Case 84. Van den Wildenberg.[75]—Female, aged twenty-seven years. Admitted June 14, 1908. Otitis media suppurativa chronica, right. Periodic exacerbations. Frequent attacks of headache. Vertigo. For past two weeks, intense

pain in right ear. Chills. On admission, temperature, 41° C.; pulse, feeble and rapid. Tenderness over emissary. Tenderness over right side of occiput. Swelling along right jugular. Cerebrospinal fluid normal.

June 15—Operation. Jugular resection. Radical mastoid. Perisinus abscess. Sinus incised; thrombus.

June 16—Temperature, 38° C. Slight headache, vertigo. Patient has hearing.

June 19—Bulb operation. Contains broken down clot.

June 20—Slight facial paresis. Pain in chest. Râles. Emaciation.

June 21—Vertigo. Ataxic gait. Falls toward diseased side. No nystagmus. Pain and tenderness in occipital region.

June 24—Cerebellum incised; pus.

September 10—Discharged cured.

Case 85. Venin, M.[76]—Male, aged nineteen years. Otitis media suppurativa acuta, both. Left side got worse. Walking became difficult. Vomiting, headache. Entered hospital, August 16, 1910. Remission of symptoms.

September 4—Intense headache. Slight weakness on left side. On walking, tendency to deviate to right. Photophobia. Horizontal nystagmus to right only on looking to extreme right. Slight bilateral congestion of optic nerves. Pulse, 56.

September 6—Operation, left. Sinus and dura of posterior fossa exposed. Appear normal. Two punctures of cerebellum. No pus.

September 8—Cerebellum again incised; pus. Cure.

Case 86. Whitehead, A. L.[78]—Male, aged fifteen years. Otitis media suppurativa chronica, left. Two weeks, pain and mastoid swelling. Temperature, 99° F.; pulse, 98. Radical mastoid operation. Perisinus abscess. Persistent headache. Two days later, optic neuritis. Nystagmus on looking to left. Cerebellum explored; pus. Recovery.

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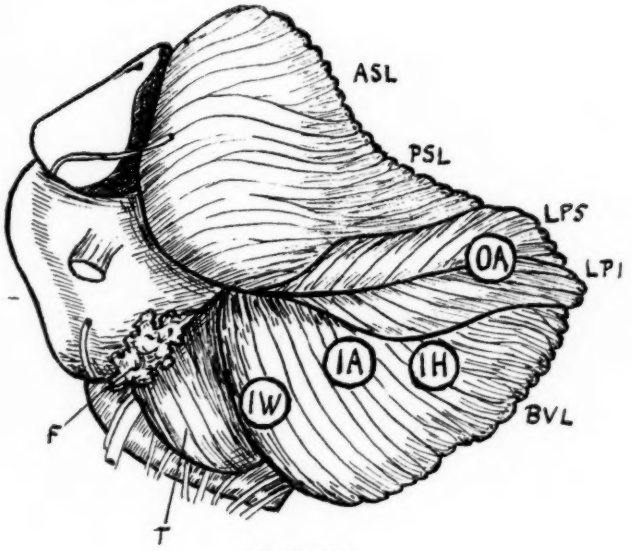

FIGURE 1.

Lateral View of Cerebellum.

OA—Center for outward movement of arm.
IA—Center for inward movement of arm.
IW—Center for inward movement at wrist.
IH—Center for inward movement at hip.
ASL—Anterior semilunar lobe.
PSL—Posterior semilunar lobe.
LPS—Posterosuperior lobe.
LPI—Posteroinferior lobe.
BVL—Biventral lobe.
T—Tonsil.
F—Flocculus.

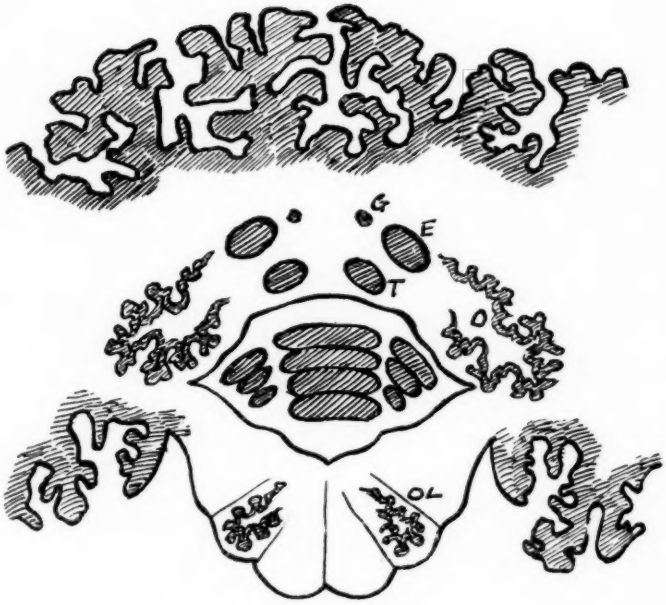

FIGURE 2.

Transverse Vertical Section Through Cerebellum and Medulla.

O—Cerebellar olive.
T—Nucleus tecti.
E—Nucleus emboliformis.
G—Nucleus globosus.
OL—Medullary olive.

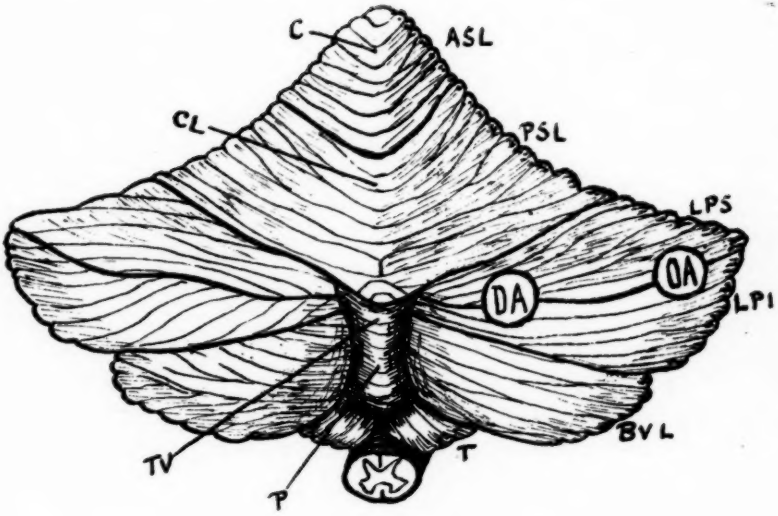

FIGURE 3.

View of Cerebellum From Behind.

OA—Center for outward movement of the arm.
DA—Center for downward movement of the arm.
ASL—Anterior semilunar lobule.
PSL—Posterior semilunar lobule.
LPS—Posterosuperior lobe.
LPI—Posteroinferior lobe.
BVL—Biventral lobe.
T—Tonsil.
P—Pyramid.
TV—Tuber valvulae.
CL—Clivus.
C—Culmen.

II.

SOME REMINISCENCES, REFLECTIONS AND CONFESSIONS OF A LARYNGOLOGIST.*

By John Noland Mackenzie, M. D.,

Baltimore.

In responding to the courteous and flattering invitation to be with you this evening, and in casting about for a subject upon which to address you, it has occurred to me that, instead of treating you to the arid narrative or perhaps profitless discussion of some of the unsettled questions which have divided laryngologic opinion now and at other times, and upon which I, and not you, should seek enlightment, I would ask you to come and live with me for a few moments in another and an earlier time, in a distant day and atmosphere, in which the grown-up virile puissant laryngology of this great age of human progress was yet in its swaddling clothes. And if in doing so I shall become personal as well as reminiscent, shall give you a chapter out of my own life and my own experience, I pray you to be charitable enough not to misunderstand me, but let me believe that my words are not addressed to the unsympathetic and critical ear of strangers, but to a little circle of friends gathered around the family fireside, where I may talk with the freedom of one who is at home, and where I feel that to many of you at least I may speak, as the ancient Roman has it, "in loco parentis."

In the seventies and early eighties of the last century, the Hospital for Diseases of the Throat and Chest in Golden Square, London, was the Mecca of the vast majority of English-speaking students of laryngology, who came there attracted by the reputation and engaging personality of Morell Mackenzie, then at the zenith of his professional career. Whether they went for study elsewhere or not, sooner or later

*Address delivered at the College of Physicians, Philadelphia, at a meeting of the Philadelphia Laryngological Society, March 7, 1916.

their footsteps turned to Golden Square, either for passing curious observation or more serious and continuous work. The institution itself was a model of simplicity, both in architecture and equipment. In secluded isolation, it stood in the little square in the narrow zone which separates the throbbing, restless, rushing life of the metropolis from the poverty and squalor of the slums, and in a silence broken only in the daytime by the roar of Regent street, near by. The lower floor of the building, where most of the work of the hospital was done, consisted of a very large waiting room. It had to be large to accommodate the then largest laryngologic clinic in the world, an examination room of ample size, but simply furnished, which, in turn, opened into a very much smaller and more private one, which was consecrated mainly to physical diagnosis. In the more capacious apartment were tables and lamps for the attending surgeons and chief of staff. The upper floor was occupied by the in-patients, and was always full. It was amid these modest surroundings, in picturesque contrast to the princely apartments and imposing apparatus of some of our modern, up-to-date laryngologic establishments, that many of the men who were destined to direct the after-progress of laryngology in Great Britain and America were not taught, but learned for themselves, the first lessons of their art. I entered on my duties as chief of staff in the summer of 1879. My predecessors in office were Felix Semon, Samuel Johnston of Baltimore and Lennox Browne. I had qualified beforehand for the job, and having acquired the principia of the subject in the old Metropolitan Throat Hospital in New York, in spare hours snatched from my service in Bellevue Hospital, and under the tutelage and inspiring example of my old friend, Clinton Wagner, one of the pioneers of the specialty in America and founder of the New York Laryngological Society. At that time, with all the enormous material at our command, there was practically no instruction given, except in the way of hasty demonstration of cases, and if the student or visitor learned anything, it was through close personal observation on his part, and not through any gigantic effort to impart knowledge on the part of the medical staff. With one or two exceptions, the latter directed their attention almost solely to the larynx and thyroid gland, and the nasal passages were only examined when in quest of a polypus or when the

attention was irresistibly attracted to these organs by the horrible stench of an ozena. The nasal cavities were practically neglected, and the only apparatus in the hospital for the treatment of their diseases consisted of a pair of forceps for the removal of nasal polypi, and a handball atomizer with a detergent solution for the treatment of ozena or any other miscellaneous disease of the nose that might irresistibly obtrude itself upon the recognition of the medical staff.

I have said that we concerned ourselves chiefly with affections of the larynx and thyroid gland. Let me pass briefly in review our then treatment of some of these affections. Among our most frequent visitors to the clinic were cases with tuberculosis of the larynx. They literally abounded. They came by the hundreds, in striking and conspicuous contrast to the comparative rarity of this disease in the throat clinics of today. Many of them presented the classical picture first drawn by Morell Mackenzie, which we considered then pathognomonic of tuberculosis. It should be stated here that the grouping of signs, turban epiglottis, pyriform aryepiglottic folds, etc., so graphically described by Mackenzie, was not considered characteristic outside of England, and I must say that in my own observation I have never seen such constancy in the ensemble or grouping of appearances, either on the Continent or in the United States. At that time much difference existed among laryngologists concerning the value of laryngoscopic diagnosis in this disease. Ziemssen was the first to deny its certainty, and subsequently Heinze, and even Morell Mackenzie, gave in their adhesion to his views. Lennox Browne, on the other hand, goes to the other extreme, or, rather, went to the other extreme, and declared that, with the exception of laryngeal growths, there is no disease of the larynx in which we may be so sure of laryngoscopic diagnosis. The partisans of both these views are too sweeping in their statements. There are many cases met with in practice in which the diagnosis must remain in doubt. I believe the case can be briefly stated as follows: The diagnosis of the lenticular ulcer, especially when single or unassociated with other tubercular lesions, is laryngoscopically impossible; even when the ulcers are multiple, and bilaterally situated on the cords or vocal processes, then can only be looked upon with suspicion in the absence of other signs of the disease. This same is true of the aphthous

or diphtheritic ulcer. Even the ulceration which results from infiltration is not always typical in appearance, and may need the association of other tubercular lesions to proclaim its true nature. When infiltration is unilateral, the diagnosis is sometimes shrouded in doubt, except when multiple ulceration has taken place. The association of the turban-shaped epiglottis with the pyriform swelling of the aryepiglottic folds is characteristic of tuberculosis, and should not be confounded with edema, its closest simulator. It should here be remembered, however, that edema may complicate the case and cause uncertainty as to its real nature. When to the characteristic infiltration of the epiglottis and aryepiglottic folds is added the typical worm-eaten superficial serpiginous ulceration, the grouping in the picture is pathognomonic. The typical laryngeal tubercular ulcer resulting from infiltration, in its development, appearance and course does not resemble any other laryngeal disease with which I am familiar. The lesions of this—and this is true of many other diseases—may, of course, occur in atypical forms, the characteristic grouping may not be present, and the diagnosis may be left for a while in doubt, but this does not invalidate the position that tuberculosis manifests itself laryngoscopically (in the larynx) in a manner different from any other known form of disease.

The subject may seem trite and superfluous, but I have introduced these remarks on the laryngeal picture in tuberculosis in order to emphasize the importance of the laryngoscopic or naked eye method of diagnosis (supplemented or not, as the case may be, by clinical phenomena) to the exclusion, if possible, of the microscope and the laboratory in the detection of disease in the larynx. In these days of unquestioning reliance on and faith in chemical and other strictly scientific, as contradistinguished from purely clinical aids in disease discovery, it is in many quarters at least fast becoming a lost art. As the introduction of the modern, direct methods of examination have done away largely with much of the old-time manual dexterity in intralaryngeal and tracheal manipulation, so the common use of laboratory tests have, by opening up a lazier and easier road to diagnosis, greatly dulled the former diagnostic sense and diagnostic acumen. To overcome this unfortunate condition of affairs in the coming generation, the student should be shown as many cases as possible of a given

malady, in order that the picture of the disease may be so photographed on his brain and embedded in his memory that he may be able to recognize it by sight alone when brought before its image in the mirror. Take him back to the old-time initiative in diagnosis, teach him to rely more upon his special senses, tell him that, after all, personal observation and clinical experience are less fallacious than the more artificial, although more strictly scientific methods, even though the latter may be, in many cases, indispensable and in some ways more exact. It is only human to make mistakes. Let him not, therefore, in case of doubt, run to the laboratory at once for help, as is the rule in most cases today, but without in the least degree underestimating its inestimable value and assistance, let him seek it as the court of last resort. In other words, let him make the diagnosis with the naked eye alone; form his opinion in this way first, even though he may have to control it in the end by scientific tests.

The student should be schooled not only in the naked-eye appearance of laryngeal disease, but also in what is even more necessary—early laryngoscopic diagnosis. The supreme and far-reaching importance of the latter ought to be evident to intuition, and the very mention of the subject in a company of laryngologists should be looked upon as a piece of gross impertinence: and yet, unthinkable and incredible as it may seem, to many workers in this special field today, whose vision does not carry beyond the tonsil, whose horizon is the palatal arcade and whose ignorance of what lies beyond it is as boundless as the deep, it is a neglected or even unknown accomplishment. A fellow-laryngologist, an excellent man and a good surgeon, who had wasted a number of years out of what might have been a wholly useful life removing tonsils and doing submucous resection, when asked by a brother practitioner about the laryngeal appearance in one of his cases, exclaimed, "Larynx! I know nothing about the larynx!"

It is impossible to exaggerate the importance of the laryngoscope to the medical and surgical diagnostician in the early detection of disease, not only in the respiratory organs themselves, but, of equal, if not superior importance, in neighboring and remote organs of the body. Long in advance of the appearance of classical signs and symptoms of disease in other organs, it often points the way to grave disorder.

Not to multiply examples, how often is such a seemingly innocent performance as a lame or staggering cord in an otherwise apparently healthy individual the early herald of the existence of some formidable affection, such as malignant growth, central nerve disease or aneurism, or a tiny moist or weeping ulcer on the vocal process or a vegetation in the interarytenoid space to the alert and practiced eye the tell-tale, though silent, witness of tuberculosis!

Every tumor of the larynx, no matter how benign it may appear, should be examined with the greatest possible care. Some of the most fatal diseases known to man make their first appearance in the larynx in the guise of great benignity. Thus the presence of cancer and tuberculosis in the individual is often first proclaimed by the discovery of an apparently simple papillomatous excrescence in the larynx. By the careful study of every case coming under our observation we will some day, among other things, clear up the mystery which surrounds the genesis of papilloma and approach more closely with the naked eye alone the earliest possible recognition of some of the most deadly diseases of the larynx.

One day a man was admitted to my division in Bellevue Hospital with the diagnosis of typhoid fever, but who presented an appearance which I had never seen in that disease. Not knowing what ailed him, I called the resident medical staff in consultation, and the consensus of opinion was that, while his trouble was not such as had been diagnosticated, it was impossible to classify it, to give it a name, as none of us had ever seen its like before. Janeway was summoned. "Acute ulcerative endocarditis." In view of the fact that there were no detectable morbid heart sounds present, the diagnosis was a brilliant one, and was verified by autopsy on the following day. At that time the disease was practically unknown, certainly not generally known, on this side of the Atlantic. I had read somewhere an abstracted account of the affection, taken from a French journal, but had forgotten it. In the absence, apparently, of heart trouble, how could you possibly make such a diagnosis, he was asked. "I don't know, but I have seen a case," was his reply.

The local treatment (of laryngeal tuberculosis) consisted in the use of hot and cold soothing and stimulating inhalations, the insufflation of an opiate, generally morphin, followed by

a mixture of iodoform and starch and the use of the esophageal tube to facilitate deglutition, and our one consoling thought was that we had placed our patient in a condition in which he would suffer the minimum amount of pain and approach the end, if possible, with resignation and an equal mind. All were doomed to die; the appearance of the disease in the larynx was the warrant of death. We did not know then that some of the very worst cases could be saved. It was not until years after that I had the truth of this latter statement brought forcibly home to me by the following case, which I take from several others quite as remarkable:

Mr. B., a small, important little man, with an iron will, came from a distant city to consult me before going west for his health. He had a good-sized cavity in the left apex; both ventricular bands were the seat of broken-down infiltration, the ulceration covering both surfaces completely and extending into the ventricles. There was marked infiltration of the ary-epiglottic folds (pyriform swelling), which had, however, not yet ulcerated. Physically, he was in very bad shape; was very weak, and in no condition to undertake even a short journey. I advised him to return to his home, give up his business (that of banker) and live in the open air, and on no account to attempt his trip to the West, as he might never reach his destination alive. It was Seneca who said that it is a part of the cure to wish to be cured. Well, this little man wished to be cured, and cured at all hazards. And he therefore did not take my advice. The next time I saw him, two years later, his chest cavity had become obsolete, the laryngeal infiltration had disappeared, and the ulceration had completely healed. He had gone to Colorado, pitched his tent in the wilderness, lived in the open air, and, as far as possible, in silence and in solitude, and during the entire absence from home had taken no medicine, nor had he even laid eyes on a physician. Again, and against my advice, he returned to his former business. In six months ulceration broke out afresh in the larynx. This time I told him to take the fastest express to the West. To make a long story short, I saw him twenty-one years after his first visit to me. He was perfectly well, and, apart from the scars in the larynx, no one would have known that he had ever been hurt. Remember, this was not a case which happened yesterday, or the day before, but long years before man had surrendered to nature the care of tuberculous disease.

Among the cases of general and laryngeal tuberculosis which presented themselves for treatment there were a goodly company of the variety of laryngeal neoplasm, which I have called in my classification of the laryngotracheal neoplasms occurring in that disease, papillomatous excrescences, vegetations and tumors, and which I have discussed at length elsewhere.[1]

As this form of tumor is yet imperfectly understood, as very little is still known concerning its histologic nature, and in view of the fact that the determination of its essential character will have an important bearing on its treatment, I will again venture a word concerning it. These are the members of the second group, and are closely allied macroscopically to simple laryngeal papillomata, for which they are easily mistaken. They are the growths which every student learns to recognize in the alphabet of his special studies. They are often the avant courrier of laryngeal and pulmonary tuberculosis, and may remain for a long time as the solitary outward and visible sign of that disease. Their presence in the interarytenoid fold often furnishes strong presumptive evidence of incipient tuberculosis. They vary greatly in size, shape and situation, sometimes projecting from under the anterior commissure of the larynx in the form and appearance of a spray of coral, at others filling the larynx with growths macroscopically indistinguishable from simple papillomata, which are sometimes so abundant as to cause stenosis and necessitate tracheotomy. Their most characteristic seat is the posterior laryngeal wall, where they appear as warty acuminate or leaflike outgrowths of a pale grayish or pronounced reddish hue, or banked at that situation in a solid mound, either smooth in contour or bristling with multiple acuminate projections. The histology of this class of tumor has been imperfectly studied, and may well in the future bear a more careful scrutiny. Stoerck, who first called attention to their presence in the interarytenoid fold as an infallible sign of incipient tuberculosis, following Rokitansky, regarded it as the result of an indurated proliferation of the connective tissue which occurs in the course of chronic tubercular disease of the mucous membrane in the neighborhood of the arytenoid cartilages. Kundrat, who examined several of Stoerck's cases, pronounced them essentially papillomata and nontubercular in origin. I know of no other special

observation on the subject, with the exception of the microscopic appearances of a case of my own, examined for me by Sydney Cone, then pathologist to the surgical department of the Johns Hopkins Hospital, many years ago, and reported to the otolaryngologic section of this college in December, 1904. I have not time to go into a detailed account of the anatomic report. Suffice it to say that in the sections examined the picture was that of a tuberculosis of a papilloma—papillomatous tissue infected with tubercular tissue. Whether or not the growth is originally tubercular or becomes so secondarily through infection is a point to be determined by further observation. Without going into explanatory detail, the study of the sections developed facts which were not only of histologic, but also of eminently practical importance. It was especially interesting from a diagnostic point of view in the microscopic differentiation of this form of outgrowth from the papillary variety of epithelioma, particularly when, as sometimes happens, the tubercle bacillus is found only after a diligent and prolonged search. It also went to show that incomplete attempts at removal only served to stimulate the local growth of the neoplasm and increase the danger of reinfection. It will be the task of the future to determine whether all growths of this nature found in a tubercular subject show a tubercular structure, or whether there are some that adhere to the strictly papillomatous type. Whether benign or tubercular, the very fact that this variety of tumor often heralds the approach or proclaims the presence of tuberculosis in the individual only emphasizes the importance of examining with care not only clinically, but microscopically, all papillomata taken from the larynx and trachea. With regard to their mode of development, it is quite possible, as Cone has suggested, that in some cases at least they may have an origin analogous to the papillomata found in the urethra and vagina, which are probably produced by infection by the tuberculous discharge from the bladder and uterus.

This variety of outgrowth was always looked upon as perfectly legitimate surgical prey. I have often removed the entire tumor or portions of it, calmly and utterly innocently oblivious of the fact that I was in so doing stimulating its local growth and scattering the disease elsewhere, thus shortening the journey of the patient to the grave. Looking back

through that night of meddlesome, though innocent surgical transgression, as I view it in the long experience of after years, and fully mindful of the fact that the universal sentiment of authority counsels immediate surgical removal of all growths in the larynx of the tubercular subject, I must confess that even now I approach the consideration of their treatment with great trepidation as I give you the advice, which I gave in this college, but before another society, over twelve years ago. The mere presence of a tubercular tumor in the windpipe is not always necessarily an indication for its removal. If an operation is to be done, it should be done for good and sufficient reasons, and after weighing carefully all the facts in each individual case. Tubercular tumors of the larynx, as far as we at present know, pursue a slow course, show little tendency to early ulceration and may survive with unbroken surface the process in the lung. In their removal by ordinary methods the possible dangers of autoinfection, with metastasis and reinfection at the seat of operation, should not be lost sight of. That these dangers are not chimerical is apparent from some of the recorded literature of the subject, and notably in the case of Hennig, in which death from reinfection took place thirty-seven days after the operation. In my own cases two were found postmortem, two were already past all surgery, while the fifth remained with unbroken surface for ten years, and was not touched with instruments of any kind. Serious interference with function should, of course, constitute ground for operation, and the character of the latter will depend on the nature of the case. Whatever method of procedure is adopted, it must be radical and include not only the removal of the growth in its entirety, but also a liberal portion of the surrounding healthy tissue. A closer study of tubercular tumors of the larynx will be necessary before we can formulate a definite plan of surgical treatment. In the meantime, we must watch and wait.

Out of all the joyous hours at Golden Square that still linger affectionately in my heart and in my recollection, there comes to me but one disturbing and discordant memory—our treatment of cancer of the larynx. This consisted, I shudder in the telling, in the performance of tracheotomy, and the subsequent removal, piecemeal, of the growth through the natural passages. By this process, which today in enlightened sur-

gical communities would be considered as a means of slow murder, the growth was stimulated at once into much greater activity; the patient naturally became worse and worse, and was sent to his long home much earlier than if he had been left severely alone. Of course, there was never a thought of cure. The patient was passed around from surgeon to assistant, and from assistant to student, each in his turn removing fragments from the larynx. One of the visitors to the clinic said, on one occasion, of a case thus maltreated, "Look at the poor devil; he has been plucked at by every expert and tyro in the place!" Naturally, the more the forceps were used, the more desperate bcame the plight of the patient. These were in very truth the days of frightfulness in the management of this disease. As I have often said since then, when I look back through the years in which I have seen cancer of the larynx maltreated, and in which I have unconsciously maltreated it myself, I am simply appalled at the retrospection. With the accusing voice of those days of sacrifice and slaughter still ringing through my mind, and in full view of the chastening experience of succeeding years, I trust that in the long and bitter fight that has raged around the treatment of cancer of the upper tract during the two last decades I have at least in part atoned for the sin of my youthful experience, although I have been held up as a still greater transgressor for demanding in all cases of larynx cancer the most radical measures, and for keeping hands off the growth until the last. Just here permit me to correct a wrong impression that seems to have been created in the minds of some of my colleagues, both at home and abroad, as to my views on microscopic evidence in the diagnosis of suspicious looking neoplasms of the larynx. According to my critics, I reject completely the use of the microscope in the diagnosis of malignant growths of the larynx, and therefore would recommend the complete operation for that disease in the presence of doubt as to its nature. As one of them puts it, I "kick the microscope into the dust heap." No one but a congenital fool would refuse in doubtful cases the aid of the microscope, and no one outside of an asylum would advise a radical operation (such as the one suggested by me) without a certainty of diagnosis. There are some things that go without saying and which ought to be obvious to the dullest apprehension, and I cannot think that anyone who knows me can believe

me guilty of such insanity. My original remarks made in 1900, which have called forth such a storm of abuse and misrepresentation, dealt in general principles of diagnosis, and no attempt at elaboration or specification was made. My position, as then stated, is simply that the microscope should be the court of last resort—the final method of appeal. Hands off the growth until the last. Then, if microscopic examination is necessary, let patient and surgeon be prepared for immediate operation. As I said on the occasion already referred to, "before resorting to thyrotomy as a diagnostic means in general, especially if a portion of the growth is to be removed for examination, it should be clearly understood beforehand with the patient that, if the disease should prove to be cancerous, the surgeon shall be at liberty, if in his judgment it seems best, to proceed at once to operation." I took this stand in order to check, if possible, the reckless and indiscriminate removal by laryngologists of suspected tumors of the larynx for microscopic examination, and from what I hear and read I may be pardoned if I say that the warning has not been given in vain.

As these remarks are devoted to reminiscence and confession, and not to controversy, a discussion now of the subject would be entirely out of place. As I leave it, let me turn to the last words on larynx cancer by Butlin, the inspiration and leader of the English school, uttered not long before he died. "I wish I had begun to perform it (laryngectomy) earlier. I am sure that several of the cases in which I performed thyrotomy were much better fitted for laryngectomy, and I cannot help thinking I might have saved one or two of the patients in whom recurrence took place if I had then removed the larynx. I think the glands ought to be removed in every case in which there is extensive carcinoma of the larynx, even if it be intrinsic, unless the disease is limited to the middle zone of the interior of the larynx. Even in these cases it would probably be a wise precaution to remove the glands. I have never removed the glands and the larynx at one sitting."

Catarrhal affections of the larynx were treated with inhalation, insufflation, and topical applications were made to that organ with the camel's hair brush, the use of compressed air being then unknown in England. Our main reliance was on the salts of zinc, the chlorid and the sulphat in simple, and the

sulphat of copper in syphilitic laryngitis, and I may say in passing that there are few, if any, agents that surpass in efficacy in simple inflammation of the larynx these preparations of zinc, which are among our oldest and most trustworthy servants in the treatment of this class of affection. Among the ward formulæ in Bellevue Hospital was one which we greatly relied upon in the treatment of venereal warts, and which consisted of a solution of sulphat of zinc in spirits of lavender. When this was applied to the growths, they vanished as if by magic. So striking was the astringent effect that when I started in practice I had a more elegant preparation of the zinc salt made, which I have been using successfully every since.

Comparatively little was known at that time of affections of the thyroid gland. All cases were alike to us—all were goiter. The treatment consisted either in drawing a seton through the tumor or embedding in its substance a dart of zinc shaped like the point of an Indian arrow and inserted into the body of the growth through a liberal opening with the knife. Profuse suppuration was thus set up, which after a lapse of more or less time, and after much inconvenience and suffering, caused, or did not cause, diminution in size or virtual disappearance of the growth. A photographic album was kept in the clinic with lifelike pictures, which preserved the images of the patients in the various stages of their martyrdom.

Turning now to diseases of the nose (rhinology), we find that, with the exception of polypus and ozena, it was practically a closed book. Even with deflection of the septum (can you think it?) we had no concern. The same was true of the accessory sinuses. In the second volume of Morell Mackenzie's classical work, published as late as 1884, in the section on nasal diseases, the subject is not even mentioned. Even the antrum was overlooked, in spite of the fact that centuries before, Drake and Cowper, and the two Meibomii (father and son), had lent their influence to the necessity of the investigation of antral diseases, and to the surgical methods for their relief. And Palfyn, in the seventeenth century, had called attention to frontal sinus suppuration, and proposed the trephine for its cure. All that I knew about the sinuses was contained in an article by Sir William Hamilton in the *Medical Times*, 1845, and familiar to me in my college days through

its reproduction in an appendix to his well-known work on metaphysics. In this curious contribution he sought to combat the dogmas of phrenology by showing, among other things, that the frontal sinuses were the natural abodes or hiding places of many different kinds of worms and other low forms of life.

"The motley multitude of its guests might almost tempt us to regard it as

"The cistern for all creeping things
To knot and gender in."

Much confusion existed in those days of the sixteenth and seventeenth centuries as to the source of purulent discharges from the nose, some considering them all of cerebral origin, others declaring that those which were not attended with fever, headache or pain elsewhere, and from which the pus flowed from the nostrils without inconvenience to health, as in a suppurating ear, came from what was known then as the pituitary sinuses. Nathanael Highmore, who wrote at that time, and whose name has been preserved from oblivion by his graphic account of the antrum maxillare, did not help the existing confusion much when he declared that the ostium maxillare which he described and depicted, was an immisary, and not an emmisary, foramen of that cavity. Hence those who followed him described pain in the teeth and caries as due to a "humor distilling from the head into the antrum of 'Highmore,'" thus getting the cart well in front of the horse. Let me remind you here that in the ancient Greek systems of medicine, all nasal discharges, whether catarrhal or suppurative, were supposed to come from the brain, through the cribriform plate, ethmoidal and sphenoidal cells, according to Hyppocrates; from the pituitary gland and ventricles, according to Galen. These views of the Greek physicians, whose notions of the etiology of disease were curiously influenced by the prevailing philosophic doctrines and vagaries of their time, were followed by the Arabian school, and were imported by them into Europe, and prevailed on the Continent as late as the seventeenth century, when they were completely overthrown by the colossal labors of Conrad Victor Schneider, whose wonderful anatomic picture of the nasal mucosa led Haller to christen it the Schneiderian membrane. It is true that van Helmont had long before assailed with pitiless satire the "gray-haired

dreams of the Grecians"; that Cardan had previously shown that the discharge came sometimes from the secreting portions of the nasal membrane, and that Botal had entered an anatomic protest against the hypotheses of the ancients, but it is chiefly due to the exhaustive anatomic researches of Schneider that their absurdity was demonstrated. Schneider's demonstrations imparted a great impetus to the study of the anatomy and surgery of the head. Morgagni laughed at Highmore's blunder, but conspicuous among the surgeon anatomists of his day, it was William Cowper, who was the pioneer, and who shed most light on its differential diagnosis and treatment, and made sinus suppuration give up the secret which it had kept so long.

But in spite of the fact that the subject had a literature running back to remote or even ancient times, it was not until the great grippe epidemic in the declining days of the century that has recently passed away that man first awoke to the full realization of what a curse his sinuses had been to him (and he, too, all unconscious of the fact) throughout all the centuries that had gone before. At that time, while we had made great advances in technic, while the dawn of a new era in this class of affection was breaking, it must nevertheless be confessed that we followed very closely the teachings of our masters of long ago.

In 1894, at the Congress of American Physicians and Surgeons, the subject of accessory sinus disease was given prominent place, for the first time in this or other countries, before a general medical and surgical audience of the entire society. Bosworth, Bryan and I were assigned to the task of opening the debate. The following year the first international discussion of the subject of the surgery of the sinuses was held in London at a special and unusual session of the British Laryngological, Rhinological and Otological Association. Those who took part in it and gave their views and experiences were Bosworth, Luc Delavan, Moure, Lennox Browne, Daly, Mayo Collier, DeRoaldes, Dundas Grant, Krause, Bryan, Bark, Sajous, McIntyre and Stoker. For some inscrutable reason I was asked to open the debate. The remarks of those who followed me were most instructive, and for that day a fairly thorough exposition of the then status of the question. I mention these two occasions, for they were among the early

signals for the onrush of the coming events in this special department of surgery, which had already cast their shadows before. The ball had started to roll, the pot had commenced to boil; the worst was yet to come.

No, I shall not disturb the tonsil question. God forbid! I am down in cold, remorseless type in many places on that subject, and even if I wished to run away from my convictions I would have no avenue of escape. I only want to say that those far-off days at Golden Square were perhaps the tonsils' happiest and most halcyon time; for it had not then been found out that the germs of a multitude of diseases common to man left well-established, convenient and natural avenues of entrance into the body to seek their destination by other and more devious paths through the tonsil substance; nor had this invading host of pathogenic visitors, some well known, others nameless and nondescript, yet found in the tonsil crypts and in the tonsil vessels either a birthplace or an asylum. They fell; yes, fell as leaves in Vallombrosa. Not a day passed that did not take its bloody toll of tonsils. The guillotine was nearly every day much the busiest instrument on the job. In all that long roll of cases I fail to recall a single serious accident after tonsillotomy, except now and then severe hemorrhage; nor have I ever seen since then the operation done with more dexterity and thoroughness. If the surgeons of those days did not do as much far-reaching good as the tonsillectomist of the present time, they certainly did infinitely less harm.

One of the strangest things in the early development of rhinology in England and America was the slow and belated perception of the importance and significance of the condition falsely known as adenoids. Although over ten years had elapsed since the publication of Meyer's work on the subject, and although two years later it had been translated into English in the transactions of the Medical and Chirurgical Society of London (1870), very little attention was given to it in the clinic. Woakes and I operated on a great many cases. Woakes wrote a paper in which he maintained the papillary nature of the growths against the generally accepted belief that they were glandular or adenoid in structure. We never knew our mistake until French had to tell us that they were neither papillomatous nor adenoid, but lymphoid in character. Woakes was an interesting personality, with original,

but often erroneous, theories. His work on "Necrosing Ethmoiditis," while pathologically hopelessly wrong, served to first rivet attention on the study of ethmoiditis, and was therefore historically the beginning of the modern literature of that affection.

In looking back to the old days in London, allow me to recall yet another experience, which to me at least has a certain historic interest. One morning I received a visit from a friend and fellow-lodger in the house in which I had, as the English say, "chambers." He was a phlegmatic Dutchman, a born linguist (spoke seven or eight foreign languages fluently), a globe trotter, an observer of a most inquiring and eager mind. He had come to consult me about a coryza which invariably and only occurred after sexual indulgence. I told him that he must be dreaming, or that he must catch cold during the sudden cooling off process following the heat of tempestuous bodily exertion. Not at all. He did not get unduly excited at the time. On the contrary, he was more or less indifferent to coitus, but practiced it one day a month as a physiologic duty (or purge), as a matter, as it were, of personal hygiene. It was a part of his philosophy. One night during the month, coitus, the following morning always coryza.

The situation was unique, interesting, absolutely new to me and others to whom I told the tale. Shortly after this experience I stumbled quite by accident in the clinic on two women who complained of stoppage of the nose, sneezing and watery discharge, occurring only during the menstrual period. Not to delay you with a longer recitation of the circumstances in the case, without a guide, in an absolutely unknown territory, coming across an observation here and there and ever on the alert and looking for cases bearing on the subject myself, at the end of five years I had accumulated enough material from which to generalize and publish my conclusions, which I did in the *American Journal of Medical Sciences* for April, 1884, in an essay which was the first attempt to reduce this curious relationship to a scientific basis. This, then, is the simple story of the almost accidental discovery of a then unknown physiologic relationship which today has an enormous literature. Two years ago I received from Germany a work by the younger Seifert, which consisted of a critical review of nearly

three hundred brochures, theses and papers on the subject, and even this list of contributions was incomplete.

From London I went to Munich, where I became an assistant in the clinics of Zeimssen and Oertel. Zeimssen was a prolific writer, but is chiefly known to laryngologists as the author of the articles on diseases of the larynx in his well-known Eycyclopaedia of Medicine. Oertel wrote little or nothing on laryngology, but his articles on the physics of laryngoscopy were the most scientific of his day. Zeimssen, a tall, distinguished patrician type of man of advanced years; Oertel, a little hunchback dwarf of middle age, but whose face was intelligence itself, and whose eye was as piercing as the Roentgen ray. Both masters of internal medicine, both experts in laryngology.

Although a comparatively small town, the wealth of clinical material in Munich was enormous. I have never seen in a given period of time, not even in the vast clinics of London, such a number of laryngeal growths, nor have I ever seen them removed with greater skill. They came to Oertel from all parts of the Continent, and the little man, even in the most difficult cases, always made good. For the student the atmosphere was ideal, the combination of special and general work perfect. At one moment we were giving cold baths or packs to typhoid patients, in the next removing a laryngeal growth. The special branch of medicine was not studied apart, but kept in contact and closest touch with all the other departments of medicine. We could not get away from any one part of general medicine even if we wished to do so, and this leads me to say that the proper time to lay the foundation for the educated specialist is in early life, in his early studies, if possible in his undergraduate days, for it is at this period of his medical training that he is in the best position to acquire that fundamental knowledge, and, what is of more importance, that breadth of mind which is so essential to his future development. At this receptive period of the development of his mind he can best recognize the limitations of each special branch of medicine, and can best be taught to generalize pro foundly not in one, but in all departments of medical thought It is at this stage of his career that it is impossible for him te cut loose from the other departments of medicine. The growth of his special studies goes on pari passu with his advance in

other lines of work, and he is brought in daily contact with disease in other organs of the body. He learns at the outset that no department of medicine is isolated and independent, but that they are all mutually dependent and coordinate. And if he is made of the proper stuff, this fundamental lesson and illuminating first impression will follow him in his special work in after life as an inspiration and a guiding star.

Those days in Munich were halcyon days. I thank my stars that I lived and learned in the older Germany, before that nation had altogether ceased to be the dreamer that she was when she entered the modern world; that I heard her music and listened to her songs in the joyous, peaceful days of the Lorelei, and not in those of the Hymn of Hate; before the departure from simplicity and simple idealism of the lovable people who gave the world Santa Claus.

Later, when I studied in Vienna, I found a different atmosphere. Here the only means of acquiring special knowledge of the subject were the imperfect courses on diseases of the larynx given by the professors and their assistants. There was no special course in rhinology, which subject, as in England, was left entirely alone. Stoerck and Schroetter were the leaders in laryngology at that time. The former, although handicapped somewhat by his method of examination, the socalled Schusterkugel, and a trembling hand in manipulation within the larynx, always delivered the goods. Hans Chiari, then assistant in pathology, now professor in Strassburg, had charge of the department of pathology in the Rudolfspital. He had five young men to help him in the laboratory, three of whom were Americans—Councilman, now of Harvard; Belfield of Chicago, and myself. It was one of my duties at the autopsies to look after the condition of the larynx and trachea, so that when one morning the body of a man who had died of cancer of the stomach was brought in for a postmortem, I was handed the windpipe for examination. Secondary cancerous deposits were present in the liver, kidney, spleen and other organs. The lungs, however, contained tubercular cavities; the pharynx, larynx and trachea were free from inflammation and ulceration. The bronchial and retrotracheal glands were enlarged, tumefied and caseous. In the membranous posterior wall, at its junction with the cartilaginous framework of the trachea, about one and one-half

centimeters above the bifurcation, was a well-defined circumscribed tumor about the size of a small bean, its long axis parallel with that of the trachea, and of a uniformly even, smooth appearance. It was covered by the mucous membrane of the trachea, and was dense in consistence, giving to the touch the sensation of a hard cancerous nodule, for which, indeed, it was mistaken. A similar growth was found in the pericardium. The microscope revealed a picture for which I was not prepared. It showed, namely, that the tumor, which seemed to have its origin in the submucous connective tissue, consisted in the main of an aggregation of distinct tubercular nodules, set in a more or less well-marked vascular network of connective tissue. The majority of the tubercles lay in the deeper portions of the mucous membrane and in the submucous tissue. A few were more superficial, lying under the epithelium. They exhibited all grades of degenerative change; in some caseation was so far advanced that nothing remained but the cellular wall. Between the individual nodules the connective tissue was hypertrophied and the seat of a moderate amount of round-celled infiltration, which had invaded the glandular follicles in its vicinity. The tissue of the trachea in the immediate neighborhood of the growth presented no remarkable change. The nodule in the pericardium showed the same histologic structure that was found in the tracheal neoplasm. Shortly after this experience I came across a similar case, in which the tumor was confined in a most unusual way to the vestibule of the larynx. The subject from whom the growth was taken died of pulmonary tuberculosis. The whole upper compartment of the larynx, including the epiglottis, aryepiglottic folds and ventricular bands, presented a remarkable appearance. It was completely covered by little mounds, which represented small, uniformly smooth, dense, moderately hard nodular growths, which lay beneath the mucous membrane. The nodules were about the size of a split pea, each merging into its neighbors, so as to form one continuous growth. The process ceased abruptly on either side at the free border of the ventricular band. There was no trace of ulceration in pharynx, larynx or trachea. Microscopic examination of numerous sections of the growth showed it to be of the same nature as the above-described neoplasm in the trachea. These two cases were absolutely unique. Chiari

had never seen anything like it before; no one had even suspected the existence of such a condition. After over a year's search through literature for similar cases, I published my own in the *Archives of Medicine*, New York, for October 1, 1882. As much confusion still exists as to what constitutes a true tubercular tumor of the windpipe, I may be pardoned for again drawing attention to the subject. Since the publication of my own, cases have here and there found their way into medical literature, some without doubt examples of true tubercular tumor as defined in my original article, whilst others—and these are probably in the majority—are extremely doubtful in nature, and must be thrown into the category of localized infiltration or into the papillomatous group, which I have already considered. A true tubercular tumor is extremely rare, and by true tubercular tumor I mean not simply any localized swelling containing the bacillus, but a distinct, definite characteristic tumor formation covered by unbroken epithelium and consisting of a congeries of miliary tubercles set in a vascular network of connective tissue and exhibiting all grades of tubercular degeneration to cavity formation. I have seen but three cases in which the diagnosis was microscopically established beyond a doubt, and two in which no histologic examination was made. As far as my limited experience goes, the tendency of this form of tumor as well as the papillomatous variety is not toward ulceration unless tampered with by incautious attempts at instrumental removal. In one case, in which the patient made a gallant fight for life of nearly ten years and finally succumbed to pulmonary hemorrhage, the growth, which consisted of a small, smooth lobular tumor in the interarytenoid fold, during that whole period, beyond a slight increase in size, remained practically unchanged. These two cases are of historic interest, inasmuch as they are the first cases on record of tumors of any kind in the windpipe shown microscopically to be tubercular. They therefore represent the earliest exact knowledge of this form of tuberculosis, and are the first to establish the separate existence of this previously unknown phase of that disease.

As in London, so in Munich and Vienna, no attention was paid to the nasal passages or accessory sinuses, and therefore no courses on the subject were given. I had to turn my steps homeward to learn something about the diseases of these or-

gans. Here, too, I entered a practically untrodden field. The subject holding the center of the stage and overshadowing every other at that time was the surgery of the turbinated bodies, and especially the inferior, in the treatment of the hypertrophic form of rhinitis, and the operation engaging most attention was the removal with the cold wire snare of the posterior hypertrophied end of the inferior body for the relief of that condition. Although these masses were probably removed again and again with the wire, as anyone can convince himself by referring to the standard surgical works of the last two centuries, their true antomic significance and relation to nasal inflammation was not properly appreciated until Bigelow demonstrated the erectility of the tissues concerned in their development. As I have pointed out elsewhere,[2] Bigelow was not the first to show the erectility of that structure, but to him, apart from independent discovery, belongs the credit not only of giving the best description of this tissue, and of more accurately defining its minute structure and extent of distribution, but also of showing that the so-called mucoperiosteum of the posterior part of the septum is in reality an erectile substance. Bigelow was also the first to observe the alternate inflation and collapse of these bodies, which he compared to that of the lungs of a small animal, thereby leading the way to the rational interpretation of nasal inflammation. From their resemblance to the cavernous bodies of the penis, Bigelow gave them the name of turbinated corpora cavernosa, but as Henle and, more recently, Zuckerkandl have pointed out, they may be with more propriety classed among the contractile as contradistinguished from the erectile tissues.

The credit of urging the necessity of their removal by the cold wire snare belongs to Jarvis. Prior to that the galvanocautery had been used in this country and Germany. In the latter country it was extensively adopted, and it is a noteworthy fact that Zaufal, who is an enthusiastic advocate of the cold wire snare in the removal of polypi, recommends the cautery for turbinated hypertrophies. Jarvis was followed by Bosworth, who wrote enthusiastically upon the subject. I wrote about it, everybody wrote about it, and everybody operated. One of my colleagues said that, on leaving my office one day, he trod on what he thought was a lot of peanut shells, but on picking some of them up he found that they were turbinated

bones. The operation in the course of time was abandoned. The operators went to the other extreme, as in the case of all surgical crazes. The operation, however, within proper limits did much good, for the following reasons: In cases suitable for it, it fulfilled in a simple and radical manner the removal of the obstruction, and it did this without interfering with the normal air currents in their curvilinear course through the middle meatus, as that avenue and the anterior portions of the passages remained unchanged in their anatomic relation, thus preserving intact normal respiration and natural filtration of the air. As the hypertrophied mass meant tissue largely deprived of function from the loss of glands and blood vessels, their absence involved no sacrifice of physiologic usefulness, while their removal not only facilitated cleansing of the posterior nares, but also diminished apparently the amount of tenacious mucus which they contributed to the nasal discharge. It also seemed to relieve the collateral congestion in other parts of the cavernous structure. Finally, in some cases it caused the complications of socalled reflex character to disappear, especially cough and asthmatic breathing. The latter is easily understood when we reflect that it is this portion of the reflex sensitive area of the nose that is most responsive to reflex producing impressions, notably those concerned in the production of cough and asthma.*

The simple removal of the posterior end, leaving the rest of the structure intact, is a safer and much more rational procedure than the wholesale destruction of the turbinated bodies,

*The effects or sensations produced by irritation of the nasal mucosa, whether by mechanical, simple tactile or electric contact, chemical or thermic agencies, or by a pathologic process, are more correctly appreciated and located in the anterior than in the posterior portions of the nasal passages. The more we recede into the deeper regions, the nearer we approach the pharynx, the more vague and indeterminate and inexact are the messages which stimuli carry to the central nervous apparatus. Thus, for example, in stimulation of the lower and posterior portions of the nasal cavity the sensation of irritation or hurt is, in many cases, referred not to the nose itself, but to the larynx, and in some instances to the bronchial tubes, producing in the one case cough and in the other bronchial wheezing. This is not only experimentally but clinically true. Now in calling attention many years ago to a special sensitiveness to certain reflex producing impressions in the nasal mucous membrane, I did not, nor do I now, as has been wrongly inferred, desire to maintain that pathologic reflexes may not originate from other portions of the

which is the routine practice so common at the present day of those who forget that the aim of nasal therapeutics is preservation of function, and not the destruction of everything in sight. Let me repeat in this connection what I have said upon another occasion:

No one questions the frequent necessity of the complete or incomplete sacrifice of the middle turbinate bone, notably in the case of accessory sinus suppuration and the radical cure of tumors of the nasal and accessory cavities, and, in occasional cases, as a substitute for operation on the septum. But to make it responsible for a host of woes unnumbered, and to attack it surgically from a purely theoretic standpoint, is vicious both in principle and practice. Especially preposterous is its removal for the alleged cure of the disease falsely called hay fever. In dealing with this structure, it should always be remembered that its anterior end is one of the chief buttresses against the admission of foreign matter to the air passages, the principal point at which filtration of the external air takes place. It should, therefore, not be assailed on indifferent and insufficient pretext, or sacrificed on the altar of fantastic hypothesis.

One of the most interesting, if at the same time one of the saddest, chapters in the books of rhinology is that which tells the story of the surgery of the septum. In the early days of my special practice, comparatively little had been done to rad-

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nose, for wherever there is a sensitive nerve filament it is possible to provoke a reflex movement.

My contention is simply this: that the area indicated in my original paper represents by far the most sensitive portion of the nasal cavities, and that pathologic reflex phenomena are in the large majority of cases related to diseased conditions of some portion of this sensitive area. That all pathologic nasal reflexes arise from irritation of this particular area is a preposterous proposition which I do not and never have maintained. Whether a special sensitiveness in certain portions of the nasal mucous membrane exists or not, the agitation of the question has led to more rational methods of procedure in the treatment of a large class of nasal affections and to more conservative methods in intranasal surgery. Before the location of the sensitive area or areas, the nasal tissues were destroyed with an almost ruthless recklessness that bade fair to bring intranasal surgery into the worst repute. (For an elaborate discussion of this whole subject, see article by the author in Wood's Reference Handbook of the Medical Sciences, edited by Buck, Wm. Wood & Co., New York, 1887, Vol. 5, pp. 222-242.)

ically and satisfactorily remedy abnormalities of that structure; observers busied their brains with the burning question whether the deflected septum is turned more frequently to the right than to the left, never concerning their faculties with the remedial aspect of the subject, and in the presence of that overshadowing conundrum the treatment of the condition was lost, while many followed the ancient advice of Marcus Aurelius Severinus, who declared that, inasmuch as the distorted system was doubtless placed in that position by the will of God, it would be eminently sacrilegious to interfere with such conspicuous manifestation of Divine Dispensation, and therefore it should be left severely alone.

The measures then in vogue were the Blandin artificial perforation, a mischievous and lazy performance; the Adams' operation, the forcible restoration of the septum to the middle line with forceps, a very unsatisfactory and clumsy undertaking; stellate fracture, commonly known as Steele's, and later as the Asch operation, and the saw. Let me stop right here to do a dead man historic justice. The principle involved in the stellate fracture originated with James Bolton of Richmond, Virginia, who many years before described his method of procedure in the *Virginia Medical Monthly*. Bolton first employed an ordinary pair of buttonhole scissors, with which he made the stellate incisions. Subsequently an instrument was made for him by Tiemann of New York, and from this developed the apparatus used at the present day.

Later the introduction of the surgical drill, first driven by the dental engine and afterwards by electric power, marked a decided advance in surgical procedure. With the arrival of other and newer methods this excellent agent fell into undeserved neglect, in spite of the fact that a variety of work, and delicate work, can be successfully done with it without interruption of the duties of the individual, and without disagreeable after-results.

But in spite of these improvements in the surgery of the septum there were cases which still baffled the most ingenious methods. This was particularly true in regard to irregularities in the conformation of its bony framework, as in certain cases of deep-seated deflection in which the patient would not submit to operation or the surgeon hesitated to perform it. To overcome this difficulty I proposed in 1882, at the annual

meeting of the Virginia State Society, and carried out in the spring of the following year, 1883, an operation which consisted essentially in the removal of portions of the external wall, and notably the inferior turbinated bone of the obstructed side (or portions thereof) as a substitute, in suitable cases, for operation upon the septum itself.[3]

The method is applicable in cases in which sufficient reason exists for not operating on the septum. Its principle may also be extended in its application to other surgical procedures within the nasal passages. Its chief value is in certain exceptional cases in which other methods are contraindicated or can be carried out only with difficulty.

Since my original article was published I have received several communications from various laryngologists in this country, notably from the late Jarvis, and Roe, of New York, in which they have stated that the principle had not only given them great satisfaction, but had also extricated them on more than one occasion from great difficulty and embarrassment.

The crying need in operation on the septum is greater simplicity of performance. With a comparatively speaking small armamentarium, backed by a quantum sufficiat of good, common, surgical horse sense, the surgery of the septum is not a complicated problem, but one which can be worked out with comparative simplicity and satisfaction.

Such was the state of the question thirty-three years ago. You know its subsequent history. I will not, therefore, carry you any farther into paths which are perfectly familiar to you, and will leave you now with this brief review of the older methods, bidding you remember that it is a long, long way from buttonhole scissors to the complicated technic of submucous resection, and asking you to graciously accept this little bit of personal experience and reminder of what we had to contend with in the earlier days from one who has traveled through the dust and heat of that road.

At a banquet held several years ago by the American Laryngological Association, the toastmaster, Kelly Simpson, in calling on Bosworth for a speech, said that his (Bosworth's) saw would be still on deck long after the swivel knife had been forgotten. While this may sound to some as the irresponsible language of postprandial enthusiasm and exaggeration, at the same time it may well come to pass that in some cases we

will return to some of the older methods, or modifications of older methods, which, though less spectacular than most of those performed at the present day, did very much less harm.

The elder Disraeli, in the preface of his "Amenities of Literature," says that to be ignorant of all antiquity is a mutilation of the human mind. It has long been my custom when seeking something new to go to the ancients. So in the rush of modern invention and procedure it may sometimes be wise and profitable to pause, retrace our steps, and pass in review the work of those who have gone before. We of this generation may in this way learn much from those who, in the gray dawn of its earlier history, fought the battles of laryngology to make its calling and election sure in the eyes of their fellow-men.

In this rambling, disorderly, crazy quilt talk which I have given this little family gathering here assembled, I have endeavored in an informal way to recall some of that past, to remind you that all things did not go very well then; that difficulty after difficulty had to be met and surmounted; that the distrust in which our calling was held in many quarters had to be overcome, and that finally the laryngoscope had to be brought from its lowly place as a simple means of examination to occupy its now recognized lofty position as an instrument of progress and power in medical research, in scientific expansion and in the exploration of the unknown. The men of those days lived in a time of crisis. Laryngology was on trial, its fate was hanging in the balance. An obsession or madness such as some that have since swept through the specialty would have turned the scales, for the serpent of Esculapius had not then been driven from the temple by the Golden Calf. Remember, too, that, in that day, the earnest seeker after truth had to reckon not only with his brother in regular standing, but also with the charlatan and the professional quack. It was this latter gentry's quickening opportunity and appointed time; for in the darkness and mystery of an incompletely explored terrain they found their Canaan, and in that promised land their fields of gold. Medical men confounded them with the struggling laryngologist, whom they looked upon with suspicion, and spoke contemptuously of his limited sphere of work, quite forgetful of the fact that their own ignorance of the subject was abysmal, that their sole weapon for the con-

quest of throat disease was the probang, and that they were long unwilling to let even that frail scepter of their power, or impotence, pass to other hands.

I have tried this evening to live only in the past; to forget the present with all its wealth of marvelous achievement; to call back a part of the practice of a rugged era, some of which deserves to outsleep Endymion in oblivion, but much of which was most wholesome and good; to breathe again the purer and the happier atmosphere of that era, and to snatch from it, perhaps, some lost ideal; to roam once more through pleasant fields, wild and uncultivated maybe, but which loving recollection has forever kept full of fragrance, even though the budding hope of laryngology had not then come to flower.

ADDENDUM.

The equipment of the medical student is not complete without some knowledge of the past history of his art and the names, the personalities, the aspirations, the ideals, the lives and deeds of those who made it. It is an amputation of his mind to cut it off from the wondrous story of the birth and growth and development of medicine and its compelling progress in all the ages, through storm and sunshine, through error and enlightenment, through failure and achievement. And if he goes at it in the proper way, its study will not be labor, but will bring to him the most satisfying mental relaxation and the most refreshing consciousness of culture that cannot be obtained in any other way. In the short sketches which follow I have given a few brief references to the work of some of the men whom every student of rhinology should know something about.

Jean Fernel, or Fernelius, as he is known to the medical historian, was born in Picardie (1496), but later moved to Paris, where he acquired a large practice and became body physician to Henry II, then King of France, whose sterile wife, the notorious Catherine de Medici, was made to bear offspring through his skillful treatment, a service which so pleased the monarch that whenever he left home he always took Fernelius with him. On one of these excursions the physician's wife was taken suddenly ill with a cold and died, and her husband's grief was such that he followed her soon afterwards to the grave. Catherine had a number of children,

among them two daughters—Elizabeth, who married Philip II of Spain, and Margaret of Valois, who married the King of Navarre—and a son, Henry, who ascended the throne as King Henry III. It is interesting in this connection to recall the anecdote of the latter at the betrothal feast of Margaret, as an historic example of the power of olfactory impression in awakening sexual desire. On that occasion he dried his face, by accident, with a garment moist with her perspiration, belonging to Maria of Cleves. This so excited him sexually that, although Maria was then the bride of the Prince of Condé, he could not restrain his passion, and made her miserable, as history tells us. A similar story is told of Henry IV and the beautiful Gabriel, who later became his mistress, the King's desire being aroused when at a ball he wiped his wet brow with her handkerchief.

Fernelius was a prolific writer, but among his services to medicine he should be remembered by laryngologists in general and students of sinus disease in particular as the keen observer, who a century and more before Schneider wrote, with the ancient doctrines of the Greeks and Arabians still unchallenged, and four hundred years before our own time, drew, unconsciously perhaps, a subtle distinction between suppuration from the "pituitary" sinuses or thereabout and the purulent flux which was supposed to come from the cavity of the cranium.

Gabriel Fallopius (1523-1562), famous anatomist, whose name survives in many parts of the body, notably the Fallopian tubes, the brilliant pupil and successor of Vesalius, should be familiar to laryngologists for having introduced the cannula in the development of the modern snare and as the alleged discoverer of the sphenoidal sinus.

Aranzi, Arantio, or Julius Caesar Arantius, a celebrated Italian physician and surgeon of the sixteenth century, wrote, among other volumes, a work on the human fetus and tumors, and invented a forceps for the removal of nasal polypi. He introduced an original method for the direct examination of the nasal passages. In a wooden window shutter, opening into a darkened room, he cut a circular foramen, through which the direct concentrated rays of the sun were allowed to stream. The organ to be examined (nose, ear) was thus illumined by the column of sunlight. If the sun was not shin-

ing, or if the examination took place after dark, he used a candle or, better still, a globe of crystal filled with water through which the light was made to pass, thus anticipating the socalled "Schusterkugel" method of examination of the present day by nearly three hundred years.

Nathanael Highmore, an English anatomist, born in 1613, the author of books on the art of generation, hysteria and hypochondriasis, is chiefly known to medical scholars by his work on anatomy, published in 1651 and entitled "Corporis Humani Disquisitio Anatomica," in which occurs his famous description of the antrum maxillare illustrated by a large plate with three or four figures, in which he portrays the cavity and its relation to the surrounding structures and to the brain.

The two Meibomii—John Henry and Henry, his son, the latter born in 1638 and known to anatomy as the discoverer of the Meibomian follicles in the eyelids—were among the early investigators of antrum disease, as we learn from the work of J. G. Günz (Programma Indicit et Observationem Ad Ozaenam Maxillarem Ac Dentium Ulcus Pertinentem Proponit —Lipsiae, 1753), a learned exposition of the maxillary antrum surgery of his day.

James Drake (1667-1707), an English anatomist and surgeon, chiefly remembered by his classic work on anatomy entitled "Anthropologia Anatomica," was one of the first, if not the first, to call attention to the fact that the sanies of ozena (fetid and purulent discharges from the nose) came not infrequently from the pituitary (accessory) sinuses and more especially from the antrum.

William Cowper, an English surgeon anatomist, born in 1666, has the credit of having discovered the urethral glands (1702), which today bear his name, although they were previously found and described by Méry (1684), wrote several well-known works on the muscular system and a treatise on anatomy entitled "The Anatomy of Humane Bodies," published in 1698, which he illustrated with one hundred and five original plates, to which he added nine perfunctory ones of his own, which, with a serene audacity which is not a stranger to some of our fellow-mortals of the present day, he boldly stole from the classic work of Bidloo (1685), a celebrated Dutch anatomist and contemporary. Cowper's service to laryngology consisted in bringing the main anatomic facts of sinus (antral)

disease to light, in laying open, as it were, its pathologic condition, in showing how it could be distinguished from other affections, how easy it was with the aid of anatomy to apply remedies direct to the cavities themselves, and finally how readily the structures could be reached surgically, thus making a giant stride from the practice, which we learn from Celsus, came down from a remote antiquity, of cutting open the face even in cases of superficially situated ozena and purulent discharge and sewing it up again.

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III.

THE ETIOLOGY AND PATHOLOGY OF OTITIC CEREBELLAR ABSCESS.

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Although recent otologic literature contains many case reports of cerebellar abscess, there are but few carefully worked out pathologic examinations of this interesting condition.

Cerebellar abscess may complicate either an acute or a chronic suppuration of the middle ear and mastoid. It is, however, far more frequently associated with the chronic otitides. In the eighty-six cases which we have been able to collect from the literature since 1906 (the date of publication of Bárány's first important work on vestibular nystagmus), fourteen (16.2 per cent) have complicated the acute otitides, while seventy-two (83.8 per cent) have followed the chronic suppurations.

The reason for this undoubtedly lies in the fact that in the chronic cases there is greater destruction of bone, prolonged interference with drainage, and the presence of cholesteatoma. Thus in the vast majority of instances we find either polypi, cholesteatoma or small tympanic perforations, chiefly in Shrapnell's membrane. Furthermore, in chronic suppurative cases there usually occurs a sclerosis of the cortex which favors necrosis of the deeper lying bony structures. It is particularly in those instances in which cholesteatoma has eroded the bone and lies in direct contact with the dura that intracranial complications occur. The cholesteatoma not only seriously interferes with drainage, but also acts as an excellent medium for the growth of the invading microorganisms.

Males are attacked much more frequently than females, the proportion, in our series, being as three to one.

Neumann gives the following statistics on the relative fre-

quency of occurrence of cerebellar abscess at different periods of life:

Author.	0-10 Years.	11-20 Years.	21-30 Years.	Over 30 Years.
Koch	11	33	35	19
Okada	17	56	45	28
Körner	4	14	12	10
Heimann	16	57	38	26
Neumann	12	51	41	30

In the series here reported it occurs with greatest frequency in the second decennium, and with least frequency in the first and sixth decennium, while in the third it occurs about as frequently as it does in the fourth and fifth combined. Thus in the eighty-six cases, six were under ten years; twenty-nine were between ten and twenty years; twenty-two were between twenty and thirty years; twelve were between thirty and forty years; ten were between forty and fifty years, and five between fifty and sixty years. In two the age was not stated. It occurred forty-five times on the right side and thirty-seven times on the left. In four the side was not stated.

With regard to the etiology of cerebellar abscess Neumann differentiates between those which complicate the acute middle ear infections and those occurring with the chronic otitides. In the fourteen cases of cerebellar abscess complicating acute otitis media and mastoiditis, sinus thrombosis occurs in six. In only one, however, is there a direct connection evident macroscopically between the infected sinus and the cerebellar abscess. This proportion is probably too low, and in other statistics such evidence is more frequently met with. Although in the majority of instances the cerebellar infection is secondary to the sinus thrombosis, this does not seem to be invariably so.

Death from the rupture of a cerebellar abscess into the lateral sinus has been reported, and the fact that symptoms of sinus thrombosis occur late in some of the cases, notably those of Barr, Beck and others, brings to mind the possibility of the sinus infection being secondary to the brain abscess. Histologic proof of this etiologic relationship is not at hand. In four of the acute cases an epidural abscess in the posterior fossa was probably the pathway of the endocranial complication. So that in our series, too, the route which the cerebellar infection followed in the majority of cases complicating acute

otitis was either from a thrombosed sinus or an epidural abscess. In but one of the acute cases (Uffenorde) was the labyrinth the pathway of the intracranial infection. This was an acute middle ear infection complicating scarlet fever, and the cerebellar abscess resulted from an extension of a saccus empyema. Here, despite the virulence of the infection and the lack of resistance on the part of the individual attacked, the intracranial extension from the suppurative labyrinthitis was a circumscribed collection of pus—i. e., a brain abscess—and not a diffuse purulent meningitis.

From an etiologic point of view the cerebellar abscesses which complicate the chronic middle ear suppurations differ very decidedly from those which occur with the acute otitides. In Neumann's series there are one hundred and thirty-two cases of cerebellar abscess complicating chronic suppurative otitis media. Twenty are not sufficiently studied. Of the remaining one hundred and twelve, forty-nine—that is, 43.75 per cent—showed labyrinthine suppuration. In the series here reported, thirty-one of the seventy-two cases with chronic purulent otitis showed labyrinthine suppuration. These figures, startling as they are, are probably an underestimate rather than an overestimate. We base this judgment upon the following facts: If we examine individual reports included in our series, we find, first, eight cases reported by Michaelsen. Of these, six are cerebellar abscesses complicating chronic suppurative otitis media. In these six cases "dead labyrinth" was found five times. Again, Ruttin reports seven cases, all of them complicating chronic suppurative otitis. In six of the seven, labyrinthine suppuration occurred. Neumann reports five cases, all of them complicating chronic purulent otitis media. In these, labyrinthine suppuration occurred three times. These figures, we believe, are the result of careful clinical examination, and are not accidental. In many of the cases the labyrinthine suppuration was proven histologically.

Undoubtedly there is a small proportion of cases of cerebellar abscess in which, although the labyrinth is the seat of a suppurative process, it is not the pathway of the infection from the middle ear to the endocranial structures. In a case which the writer recently had an opportunity to examine postmortem, and in which the temporal bone was examined histologically, the following facts presented: Not a vestige of labyrinthine

end organs, auditory or static, remained. There was a fistula in the external semicircular canal filled with granulations and new formed connective tissue. From this focus the labyrinth probably became infected. The crura of the stapes were destroyed, but the footplate, although much eroded, was still present in the oval window. With the exception of this fistula in the external semicircular canal, the bony canals were everywhere intact. There was, furthermore, no erosion of the inner labyrinthine wall. The internal auditory canal contained no pus. The pathway of the intracranial infection could be traced through the inner (posterior) antral wall. In this situation there was an epidural abscess, and a perforation led through the bony wall and through the dura to the cerebellar abscess.

In our series suppurative labyrinthitis and epidural abscess occurred seven times. Thus suppurative labyrinthitis, epidural abscess and cerebellar abscess form a fairly common triad. The etiologic relationship between these three factors is not a constant one. While it is natural to suppose that the epidural abscess is secondary to the suppurative labyrinthitis, this is not invariably so. In his consideration of the relationship between deep epidural abscess in the posterior fossa and suppurative labyrinthitis, Grünberg reports a most carefully studied case. The labyrinth is the seat of a diffuse suppurative process. The windows, both the oval and round, are intact. The labyrinthine capsule is everywhere intact, with the exception of the common limb—i. e., the junction of the superior with the posterior semicircular canal. At this point there is an erosion from without inward, unquestionably caused by the epidural abscess in this location.

Ruttin has shown that in mastoiditis, particularly in those latent varieties due to infection by the streptococcus mucosus, there is a tendency to necrosis in the deep seated petrosal cells surrounding the labyrinthine capsule. Drainage from this region is particularly difficult, and an epidural abscess may result. It can readily be understood, then, how an epidural abscess in this location may give rise to a cerebellar abscess, on the one hand, and to a diffuse labyrinthine suppuration on the other.

Formerly, in many of these cases of suppurative labyrinthitis, epidural abscess and cerebellar abscess, a saccus empyema

was adjudged, upon the macroscopic findings, the pathway of the cerebellar infection. Macroscopic findings, however, are inadequate to establish such a judgment. The microscope alone is the final arbiter.

In eight cases suppurative labyrinthitis occurred with sinus thrombosis. In only one of these, however, is the labyrinth clearly indicated as the direct pathway of the sinus infection. In this instance, in addition to the sigmoid sinus, the bulb, inferior petrosal and cavernous were thrombosed. Here the infection, in all probability, started in the labyrinthine veins, extended to the inferior petrosal sinus, and thence forward to the cavernous and backward to the bulb and sigmoid.

Etiologically, pathologically and clinically, cerebellar abscess may be divided into: (a) Labyrinthogenic, (b) nonlabyrinthogenic.

In all probability at least fifty per cent of cerebellar abscesses complicating chronic suppurative otitis media are labyrinthogenic. In a small proportion of cases the labyrinth is the seat of diffuse suppuration and is destroyed, but is not the pathway of infection to the brain. On the other hand, of those cases of cerebellar abscess which complicate the acute otitides, from ninety to ninety-five per cent are nonlabyrinthogenic—i. e., they take origin either in a sinus thrombosis or an epidural abscess of the posterior fossa.

The pathway from the labyrinth to the cerebellum may follow the internal auditory canal, the aqueductus vestibuli, the aqueductus cochleæ, or a fistula in the bony capsule. In a general way, middle ear infections which progress to the intracranial structures through natural openings, lead to a diffuse suppurative process—i. e., meningitis—whereas, those that do not follow preformed paths, cause circumscribed collections of pus—i. e., either brain or subdural abscesses. The aqueductus vestibuli offers a notable exception to this rule. An infection traveling along this route is retarded probably because of the narrow lumen of the aqueduct, the facility with which protective adhesions are formed, and the fact that the ductus ends in a closed sac between the layers of a very resistant membrane—viz., the dura. Such infections, then, frequently lead to cerebellar abscesses, rarely through a saccus empyema, more often through an erosion of the bony wall of the aqueduct and the formation of an epidural abscess.

Whether the labyrinth infection leads to a diffuse meningitis or to a cerebellar abscess depends upon the virulence of the infection, the resistance of the individual attacked, and the pathway of the infection. In this regard the progress of the middle ear infection into the labyrinth is of considerable importance. Slow, erosive processes, destroying the labyrinthine capsule, are much more apt to arouse circumscribed intracranial complications than are labyrinthitides in which infection takes place suddenly through the windows. A notable example is the case reported by Thompson. In this instance cholesteatomata had eroded both labyrinths, and the latter were the seat of diffuse suppuration. Each lateral cerebellar lobe contained an abscess. The pathway of the intracranial infection was along the nerves in the internal auditory canal. That the pathway of the labyrinthine infection may be of importance in determining the character of the intracranial complication, even where the latter occurs with the acute otitides, the case reported by Uffenorde illustrates. Here the labyrinth became infected by an erosion through the promontory, and not by the windows.

Among unusual pathologic conditions associated with otitic cerebellar abscess, two cases in the series here reported are worthy of note. The one is an acoustic tumor reported by Dixon. The other is an abscess complicated by carcinomatosis of the temporal bone, reported by Hibler.

One of the most interesting problems connected with the pathology of brain abscess in general, but particularly with cerebellar abscess, is that concerning the process by which the brain substance itself becomes infected. All who have observed a number of cases of brain abscess have been impressed with the fact that in most instances the collection of pus is more or less remote from the cortex—i. e., that the majority of brain abscesses are situated in the white substance. To those who have performed postmortem examinations on a number of these cases, it has become evident that between the brain abscess and the source of the intracranial infection there is frequently a layer of brain substance which is macroscopically normal. In other words, there is a growing impression that the majority of brain abscesses do not occur through direct extension by continuity.

Even where there is a postpetrous epidural abscess, and

where the brain surface is grown fast to the dura, there is often interposed between the epidural abscess and the brain abscess a layer of normal brain tissue. Thus, Isemer, in his case report states: "It is remarkable that, although the brain surface is grown fast to the dura in the region of the epidural abscess, yet between the abscess in the white substance and the area of dura there is a distinct, if thin, layer of macroscopically normal brain." From this one might conclude that the brain abscess was not the result of an extension by continuity from the diseased labyrinth, but that the infection extended by thrombosis of small cerebellar veins which empty into the pial veins, or through the lymph sheaths around these veins.

With regard to this question, Michaelsen (quoting Uffennorde) states: "The origin of the brain infection is always the meninges—i. e., the dura and the piaarachnoid. At first the pial veins become involved and thrombosed. This thrombosis which, in the beginning, is not always septic, follows the venous channels backwards, leaving the cortex intact, until it reaches the ultimate ramifications of the veins in the white substance, where the stasis produces red softening. The infection then follows and an abscess results. The cortex is not involved because of its separate vascular system."

Even though the "origin of the brain infection is always the meninges," yet the appearance of the dura and its behavior during the postoperative treatment, often give absolutely no indication as to the presence of a brain abscess. Collections of pus within the brain, with a macroscopically normal dura, are not so rare. In a case of right temporosphenoidal abscess recently observed by the writer, the dura was disclosed at operation covered with cholesteatoma and large pussy granulations. During the postoperative dressings the dura returned to normal—i. e., it became coated with small red healthy granulations, and healing was uneventful. Two months after the radical mastoid operation the brain abscess ruptured into the lateral ventricle, and death ensued from diffuse purulent meningitis.

The observations of Heilbronn, although too isolated to be conclusive in themselves, throw a flood of light upon this question. He states: "There are few observations of brain lesions which have occurred through venous channels (Rück-

laüfigem Wege). Such affections we would expect especially in disease of the great sinus, the chief return current of the brain's venous blood. With the most frequent form of sinus disease—i. e., thrombosis and thrombophlebitis—there have been few observations of brain disease."

Oppenheim in his "Lehrbuch der Nervenkrankheiten" states that he believes there any many opportunities in cases of sinus thrombosis to observe focal brain symptoms. Hemorrhage and softening are often the direct result of sinus thrombosis, and, although such observations are rare, they probably occur far more frequently than they are observed.

Macewen reported convulsions in children which were confined to one side of the body, and which he attributed to thrombosis of the longitudinal sinus and the veins of the motor area.

Heilbronn reports several interesting cases with general and focal brain symptoms complicating otitic sinus thrombosis. In the first case, a patient with acute suppurative otitis media and mastoiditis, symptoms of meningitis followed six days after a simple mastoid operation had been performed. With a gradual rise of temperature the patient became delirious and finally comatose. Postmortem examination showed no meningitis. There was a thrombosis of the left sigmoid sinus. There were hemorrhages in both optic thalami, thrombosis of the venæ Galeni and of other basal veins. The symptoms were due to the disturbance in the intracerebral circulation. He draws the following conclusions: 1. In sinus thrombosis, by the plugging of the small veins, lesions of the brain in the form of hemorrhages and softening may occur. 2. These lesions, like many other brain lesions, may cause general brain symptoms without any definite focal symptoms.

The second case was that of a young man in whom a sinus thrombosis complicated a chronic suppurative otitis media. He suddenly became unconscious. This condition, however, lasted but a few hours, and was followed by an aphasia. Postmortem examination showed extensive sinus thrombosis. The large pial vein which surrounds the left temporosphenoidal lobe, and has its origin in this lobe, was thrombosed. The aphasia was due to the occlusion of this vein, and stasis of the blood with the consequent nutritional disturbance.

The third case, probably the most significant, was that of a young woman in whom a sinus thrombosis complicated a

chronic suppurating ear. In this instance there were signs pointing to a bulbar lesion. Anatomically there was no gross obstruction of the veins leading from this region, but in the medulla there were changes which doubtless indicated a destruction of function of this part. There was destruction of fibers, a paucity of nuclei, while the remaining nuclei stained poorly and were deformed. The picture was one of anemic necrosis. The lesions were significantly distributed about the vessels. To the center of each focus ran a small vein.

These observations, while they are, as stated, too isolated to be conclusive, yet offer strong confirmation of Uffenorde's theory. Whether this theory, regarding the manner in which the brain tissue itself is infected, holds good only for those cerebellar abscesses which take their origin in a thrombosed sinus, or whether it can be applied to all cases, irrespective of their origin, remains to be proven. Only careful histologic research will clear this point.

In the eighty-six cases which we have collected the infecting agent is stated but eighteen times. The streptococcus was found eight times. The staphylococcus was found once. Among unusual bacteria may be mentioned the colon bacillus and Vincent's spirillum and bacillus. In their study of the bacterial agents in ten cases of intracranial complications of otitic disease, Turner and Reynolds found that streptococci were the virulent organisms in seven. In not a single instance of Michaelsen's series was the infecting agent in the cerebellar abscess found in pure culture. He found different bacteria at various times in the same brain abscess. Moreover, he found that similar changes occurred in the spinal fluid. Such results are unusual.

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V.

TUBERCULOSIS OF THE MIDDLE EAR.*

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During the last five years it has been my privilege to study nine cases of tuberculosis of the middle ear, which are given here with as little accessory history as is possible without vitiating their value.

Six were in children, three in adults. One of the children's cases, No. 6, is simply a clinical diagnosis with but little to confirm it, but represents a type which has been clearly defined; and as our diagnosis in all cases is seldom confirmed by every means possible, and in nearly every case some question may be raised, I believe I am justified in trusting my personal judgment of the clinical picture.

Two of the adult cases, Nos. 7 and 8, are diagnosed more by the course of the disease and the juxtaposition of pathologically tubercular tissues in otherwise healthy individuals: one (No. 8) showing a tubercular meningitis, the other (No. 7), a tubercular ulceration of the septum.

I believe that enough work has now been done on this subject to give to the profession a well defined clinical picture; so much so that the trained aurist should be able to venture a diagnosis of tuberculosis of the ear nearly as readily as the internist does that of tuberculosis of the lungs without a microscopic examination of the sputum.

The diagnoses are based upon:

1. Clinical histories and examinations.
2. Pathologic sections, which Brieger states is the most reliable and accessible.
3. Presence of tubercle bacilli in the secretion from the ear—a rare occurrence.
4. Animal inoculations (difficult on account of mixed infections).

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*Presented as a candidate's thesis for membership in the American Laryngological, Rhinological and Otological Society.

Case 1.—Family history unknown. Fed on a formula of cream and cow's milk since birth. Has always vomited food. Wassermann negative. Salvarsan.

At sixty-four days of age the cervical glands were enlarged, and pressure on these caused a discharge of pus from the external auditory canal. Temperature, 98°; hemoglobin, 64 per cent; polymorphonuclears, 62 per cent; lymphocytes, 31 per cent; large mononuclears, 6 per cent; transitionals, 1 per cent.

March 25th, at sixty-eight days of age, facial paralysis. Examination showed granulation tissue in left canal, much pus, enlarged cervical glands. Secretion from ear showed large number of tubercle bacilli. The child died March 30th, of an acute general tuberculosis.

This is one of the youngest cases on record. The lack of careful observation leaves much to be desired, but the inference is that the tubercular middle ear infection was of much earlier date than two months of age. The route of infection here is only problematic. It may have been through the blood stream from the lungs, as the child died of an acute general tuberculosis at the age of seventy-two days. On the other hand, the child was fed on a formula and probably had an infection of the bovine tubercle bacillus through the eustachian tube. This does not preclude the possibility of a lymphatic gland infection from the tonsils and then to the middle ear, but this is a rare route. The examinaiton of the tonsils in this particular case would not have thrown any light on the subject.

Case 2.—Two and one-half months old. Weight, six pounds fifteen ounces. Discharge from both ears. Cervical gland enlargement, fluctuating on left.

The radical operation on the right mastoid showed a granulating mass filling the mastoid and middle ear, with an involvement of the promontory and petrous portion of the temporal bone about the semicircular canals. The left mastoid involvement was not so extensive. The tissue section showed tuberculosis, and guinea pig inoculations gave a typical general tuberculosis.

The child died in the course of five months, the autopsy showing a primary tuberculosis of the bowel, miliary tuberculosis of the lungs and spleen, cervical and retropharyngeal lymph glands, and double tubercular mastoid.

In this case we have a good example of the fungoid form of tuberculosis, showing the eroding process on the promontory wall and about the semicircular canals.

Case 3.—Five months old. Breast fed for six weeks; cow's milk for two months, then Eagle brand. At two months child vomited persistently. At three months mother noticed an ear moisture, and child seemed in pain. This moisture and pain lasted for twenty-four hours, and since then there has been no discharge from the ear. The mother noticed an enlargement of the cervical glands at four months. On examination a smooth, pale tumor was seen in the ear canal. The glands of the neck were markedly enlarged on the diseased side.

Radical operation showed a caseous mass filling the middle ear and mastoid. This was removed and disclosed a promontory covered with granulations, part of which were removed. Filling the middle ear was a pear-shaped, smooth tumor which had eroded the floor of the middle ear and external canal, probably by pressure. On examination this proved to be a tuberculoma. Two years later the child was healthy, showing no signs of tuberculosis.

This is a remarkable example of the necrotic form proceeding to rapid destruction and caseation of the bone without a secretion from the canal.

Case 4.—Nine months old. Normal birth at full term. Weight, eight pounds. Breast fed for four months. At five months discharge from left ear. At seven months swelling about concha. At no time has the child seemed in pain. Temperature, 98.8°; pulse, 100; respirations, 20. White blood cells, 14,000; polymorphonuclears, 56 per cent; lymphocytes, 44 per cent.

A radical mastoid was done on January 5, 1914, after nothing definite had been made out in the lungs. The baby died on the 18th, of a general tuberculosis.

At operation a caseous mass was found involving the mastoid zygoma, middle ear, anterior wall of external canal. A sequestrum of the mastoid and posterior wall was removed. The dura was not exposed. Guinea pig inoculation of masses of granulation tissue removed at operation produced a marked general tuberculosis. Pus showed no bacteria, no growth on culture media. Sections of the tissue removed showed bone

trabeculæ absorbed in many places, giving a spongy appearance. The marrow was largely replaced by endothelial leucocytes, and in areas granulation tissue. The endothelial leucocytes were massed in places and showed degeneration. In other places definite tubercles with giant cells were seen, and caseation was present. Diagnosis: Tuberculosis. Postmortem showed a marked bronchopneumonia, meninges slightly milky colored and edematous, but no pus. This case is the necrotic form.

Case 5.—One year of age. Breast fed for one month. At four months of age mother noticed that glands of neck were swollen. These were incised by a doctor, and afterward the ear began to run. Positive von Pirquet. Wassermann positive. On examination the ear was found filled with a polypoid mass and pus. This was removed together with pieces of bone. A radical mastoid was done, at which time it was found that the middle ear and mastoid region were filled with granulation tissue and sequestrated bone, involving the external auditory canal. A partial facial paralysis was observed after the operation, which cleared up within five days.

Microscopic sections showed newformed granulation tissue infiltrated with leucocytes. In some areas there was considerable collagen. Scattered through the specimen were well defined tubercles with giant cells. No caseation. Diagnosis: Tuberculosis. Child living and well.

This is a pitiful case of tuberculosis and syphilis combined, of the fungoid type, which is apparently well six months after a radical mastoid.

Case 6.—Aged seven years. Had had a slight discharge from the ear for two years, during which time there was no pain. The secretion was minimal. The drum was swollen, pale red, and did not change during the two years. Hearing poor. No nasopharyngeal trouble. The general symptoms were those of tuberculosis: loss of appetite, paleness of skin and mucous membranes, night sweats. Von Pirquet positive. For three years the ear has not troubled the child. Treatment was directed to the general health.

Case 7.—Twenty-eight years of age. Extremely good health; robust looking individual. Up to one year previous no ear trouble. At that time noticed an itching and stopped-up feeling in the left ear. No pain until two months previous, when severe over left side of head and in ear. Drum then

broke and ear ran. Was in bed on account of "grippe." Was nauseated and vomited. Dizzy for a week, room going round severely for one week. No ringing in ear. Noticed she was deaf in that ear. One and a half weeks before my first examination there was pain in the right ear; three days later a discharge, continuing for one week. Hearing has been poor since then. There was no nose cold at that time.

Examination showed total deafness in the left ear and partial in the right; spoken voice, four yards; whisper, one yard. Weber to the right. Slight discharge in the left ear. Left drum shrunken. Perforation in the posterior superior quadrant. Right drum thick, pale yellow, bulging slightly, hammer lying in a furrow, arteries radiating over drum from center. No translucency. A paracentesis needle passed through an extremely thick membrane, as though there was no cavity behind it, and there was no discharge. Two days later a thick, yellow discharge, small in quantity; on third day, no opening. The nasal mucous membrane looked moist and normal. Posterior rhinoscopy showed a granulating ulceration on the posterior border of the septum in its whole extent. This, on being removed and sectioned, showed it was a tubercular tissue.

The right drum was watched for six months, during which time it did not change its appearance much; a couple of paracenteses were done, always with the same sensation of passing through a solid mass, and giving little or no secretion save on politzeration, when there was a thick mucopus noticeable.

The right ear in this case represents the type described by Jorgen Möller,[1] which he calls a myringitis tuberculosa diffusa. He excised portions of the drum and demonstrated tubercle giant cells.

In Cases 6 and 7 we have the picture of the infiltrating form: one occurring in a child and lasting two years, with other signs of tuberculosis in the body; the other a local affair in a superbly healthy and robust individual, showing a local tubercular lesion near the tubes. The rapidity with which the left labyrinth was destroyed by the process in the adult is uncommon, but the early labyrinthine degeneration in the right ear is frequent in this type of case and speaks strongly for its tubercular origin.

Case 8.—Aged thirty-five years. As a child had been con-

sidered scrofulous; in later life healthy. Lungs normal and no signs or symptoms of tuberculosis on careful search. Had had an ear discharge all her life. At no time had it been profuse; at times entirely dry for a month, then a slight moisture; never had it run out of the canal. The hearing had been slightly impaired in later life.

Examination showed a perforation in the posterior superior quadrant, extending well into the lateral attic wall and exposing the hammer neck. There was a crust over the perforated area and slight moisture on removal. On account of the history, a diagnosis of tuberculosis was made and an operation advised; this was delayed for seven months, when the patient fell into the hands of a general practitioner on account of a "general nervous breakdown." I saw the patient some two weeks after, when there was a marked meningitis, and operated the mastoid. I found a dark black, dry appearing bone, which blackness extended to the sinus. The cells were partly filled with a granulation tisue, partly with a dark, glistening mucous membrane. This pathologic bone was less marked at the apex than around the antrum and sinus. As I approached the sinus, a profuse hemorrhage occurred from the increase of small arteries in the chronically inflamed tissues about the sinus. This ceased when the sinus was well uncovered. The patient did not experience any benefit from the operation, and died two days later. An autopsy showed a marked tubercular meningitis, the tubercles being most pronounced in the sulci on the diseased side.

This is the only case I have seen of the lupoid form of the disease. The disease progressed slowly, in attacks, with little or no secretion or discomfort to the patient, to a tubercular meningitis by a path that was well marked at operation, and probably could have been checked by an early exenteration.

Case 9.—Aged forty-five years. This was a chronic case of tuberculosis of the lungs, which developed a double suppurative otitis media in the last three years of his life. There had been a deafness in the left ear for a year and a half. Dizziness a month before death, and deafness in the right ear, coming on suddenly. There had been a facial paralysis on the left side for some months. An autopsy showed chronic tuberculosis of lungs and ears. The left middle ear was entirely filled with a thick caseous material. The malleus and incus were

destroyed, the stapes was still in position. The promontory was eroded but not perforated macroscopically. Smears from the caseous material and scrapings from the promontory showed numerous tubercle bacilli. Sections of the petrous portion of the bone showed the labyrinth to be completely filled with a caseous mass of granulation tissue showing an infiltration with polymorphonuclear leucocytes, tubercles, and giant cells of the Langerhans type. The spaces in the surrounding bone were filled with similar tuberculous granulation tissue. In the cochlea remnants of the organ of Corti might be made out.

This case is the necrotic form, showing the erosion of the promontory wall which is so familiar in tuberculosis. The process is more apt to extend to the labyrinth by a multiple perforation of the bony part than through the oval or round windows, as is the case in other suppurative processes. This explains the gradual labyrinthine degeneration and progress to deafness without the sudden labyrinthine symptoms in the old chronic cases.

Figures 1 and 2 are taken from this case. Figure 1 shows the infiltration of the petrous portion of the temporal bone, vestibule, semicircular canals and cochlea by the tubercular process. Figure 2 shows two tubercles and giant cells enlarged from Figure 1.

The incidence of tuberculosis in the ear varies so at different periods of life that no general statement is of any value whatever. Siebenmann, in a verbal statement to the author some years ago, claimed that the large majority of the ear suppurations in youth were of tubercular origin. I would modify that by making it in infancy. I cleaned out the adenoids and tonsils in all cases of ear suppuration in an orphan asylum, some twenty-five cases, ranging in age from five to fifteen years, and got an immediate cessation of the suppuration in all but two cases. These showed signs of general tuberculosis, and probably were of tubercular origin; the rest were undoubtedly a direct result of the presence of a pathologic condition about the eustachian tube. This does not occur in infants under one year of age; their ear suppurations, as a rule, persist after the adenoids are removed, leading us to the conclusion that an ear suppuration in these cases is due to some other cause than the adenoids.

Our autopsy statistics are worthless in estimating the frequency of the disease, as few autopsy surgeons ever even look into the external ear of their cadavers, let alone examine the middle ear or labyrinth. To illustrate: Wollstein and Bartlett have recently published the results of one thousand three hundred and twenty autopsies at the Baby Hospital of New York, covering a period of six years. Of these, one hundred and seventy-eight showed tuberculous lesions, ages from two and one-half months to five years; of these again, sixty-nine, or thirty-eight per cent, had a tubercular meningitis. As high as ten organs were involved in one case, but not once was the middle ear mentioned. In the light of my experience in a comparatively small clinic, I would say it was impossible to do autopsies on sixty-nine cases of tubercular meningitis in infants without having found a focus in the ear in at least two or three.

Until more careful observations are made at the autopsy table, we will have to depend upon our clinical and operative experience to draw any conclusion as to the frequency of this disease in either infants or adults. I believe its incidence in adults is much less than in infants, because of the high mortality in these latter cases; spontaneous healing appears to be a rarity, and operative interference not frequent.

It seems probable that in the ear, as in other parts of the body, the lesions are due to the actual presence of the tubercle bacillus, either bovine or human, and not to a chemical toxin generated by the bacillus in other portions of the body. Repeated attempts have been made to establish that the socalled scrofulous condition of the individual has been a factor in the production of ear discharges and of various nerve and labyrinthine lesions, but there has been no direct evidence, and most authorities look with suspicion on any such claims.

That the bovine bacillus is a frequent pronounced factor even in nursing infants is doubtful in my mind, because Ghon has proved through his large autopsy experience in Vienna, at the Kaiserin Elizabeth Kinderspital, that the disease in the vast majority of the cases is air borne to the lungs and is carried secondarily to other portions of the body. Tuberculosis occurring primarily in the digestive tract, as would be the case in infections with the bovine bacillus from the milk, are rare. This work has been confirmed by Wollstein and Bartlett in

New York, who, although not taking the extreme stand that Ghon does, approve of the general principle. In all of my cases where the possibility of a bovine infection is strong (Nos. 1 to 5), the children had received cow's milk for at least three weeks before any ear symptoms had been observed, but in those cases where autopsy was performed (Nos. 1, 2 and 4), in only No. 1 was there a predominance of intestinal lesions. For or against a path of infection through the tonsils, as might well occur in the milk borne infections, in these five cases I have no evidence.

The most reasonable path of infection for tuberculosis of the middle ear is through the eustachian tube, both for infants and adults. The constant presence of tubercle carrying phlegm, food and lesions about the mouth of the eustachian tube, together with the explosive coughs generally accompanying their presence, gives reason enough for the transmission to the middle ear without the intermediary of the blood or lymph stream. Blood borne infections do occur, and it has been well established that the tubercle bacillus circulates in the blood stream in lung infected patients; but were these infections the more common, there would certainly be more acute general or miliary tuberculosis among our patients with ear infections. Two of my infants are well after eradicating the focus in the ear, and one adult showed no signs of systemic tuberculosis.

The anatomic picture of tuberculosis of the middle ear varies widely and is evidently dependent upon the resistance of the patient and the length of exposure to the bacillus, as well as to the anatomic part involved. A patient that has been underfed, is congenitally weak, or lacks the resisting power for tuberculosis, will present a far different anatomic picture from a strong, well nourished individual, even though the lesion is limited to the drum membrane; so also will the early picture differ from a late one. In general, however, for classifying purposes, we can say that the picture varies according to the anatomic element: that is, there is a mucous membrane lesion, a drum lesion, or a bone lesion, giving three or more distinct pictures. Again, the process may be more or less general throughout the middle ear, and has been reclassified into lupoid, infiltrating, fungoid, necrotic, myringitis diffusa of Möller, and fibrinoid. Still again we have the acute and the chronic

types. These classifications are more or less complicated, but are logical, and if once understood will be found not confusing in the least.

In Case 7 one finds in the left ear a comparatively acute middle ear infection leading to dull hearing for a number of months and an acute labyrinth destruction; the right ear became a chronic infiltrating type with a diffuse myringitis. Cases 8 and 9 were chronic, lasting in one case for thirty-five years.

The pictures become much more clear if we combine in our description the clinical with the pathologic. Those cases confined to the mucous membrane are, as a rule, infiltrating—that is, pathologically give a marked infiltration confined to the mucous lining of the middle ear—and clinically are subacute at times, leading on to an early perforation of the drum, but as a rule exhibiting deafness over a long period without secretion or perforation, but with a marked thickening of the drum. This thickening of the drum varies from week to week, and even varies in different parts of the drum at different times. The involvement of the hearing is often profound, and is not due alone to a thickening of the mucous membrane, but also to a labyrinthine degeneration, shown by functional tests and permanency of the deafness after the mucous membrane has returned to normal or has changed into the chronic suppurative type due to mixed infections.

The myringitis diffusa tuberculosa of Möller is an interesting form which he has observed as a pure type, but which is evidently a part of the infiltrating form.

Scheibe and others have described a fibrinoid form—which has not been found often, and of which but few studies have been made—in which there appeared a thick, dry, whitish yellow deposit on the promontory wall which was with difficulty removed to show a pale granulating surface on the bone. I saw one case which answers this description, but did not get a chance to study it. The fibrin that was removed did not show tubercle bacilli, and the case was lost track of without our getting a history. In this case the whitish deposit was leathery, and came away from the bone somewhat like a fungous growth from a tree.

The remaining types, lupoid, fungoid, and necrotic, involve all the structures, the lupoid being chronic, and the other two either acute or chronic.

The lupoid form, illustrated by Case 8, is one that appears in adults in attacks over a long period of time. The secretion in older cases is minimal when it does appear at all, and the destruction visible through the external canal is just as misleading. Brieger states that in the earlier cases, of which I have recognized none, the secretion may be pronounced during the attacks, the hearing becoming markedly involved only to return on a subsidence of the discharge. An ultimate labyrinthine destruction in these cases is frequent.

Of all the types, the fungoid and necrotic are the ones most frequently seen, mainly because they most often appear in children and infants; and again, they lead to marked suppuration and destructive processes, gland involvements, fevers and paralyses, which compel the attention of the parents or victims.

The fungoid cases present rapidly progressing granulation forming masses which appear in the middle ear and mastoid without producing much bone change, so that the skull is not entered, nor is there a great amount of pus. The drum often appears comparatively intact, and the small bones are removed at operation covered with masses of granulation tissue. The progress of the disease is rapid, the first symptoms often being a tenderness over the mastoid with a mastoid abscess. Often the middle ear is free, the process being confined largely to the mastoid alone. Cases 2 and 5 are of this type, and show the rapidly progressing character of the lesion in infants.

The necrotic form, illustrated by Cases 3 and 4, is more often present in adults, and progresses without the formation of the fungoid masses noted in the former form. In this class the pus formation may be extreme, and the antrum and mastoid filled with a caseous mass and sequestra floating in pus. The granulations lining the cavity are small and flat, and single polypoid masses, as were present in Case 3, are frequently encountered.

The fungoid and infiltrating forms may pass easily into the necrotic, but not vice versa. The latter remains pure throughout its course, and is much less likely to be checked by operative interference than is the fungoid. The infiltrating form does not lend itself easily to operative interference.

In the functional testing of cases of tuberculosis of the middle ear, one is nearly always struck with the disharmony be-

tween the remarkable deafness and the length of time and severity of the attack. The reduced perception for the voice and the low tones is of course the most marked factor, but the perception quantitatively for all the tuning forks is also markedly and rapidly reduced, so that one is reminded of the luetic cases he sees following salvarsan, suggesting that there may be some similar toxic effect in the labyrinth as well as a disturbance of conduction. In the later stages a complete deafness may occur without any vestibular symptoms having developed, and on sectioning a labyrinth we find a complete replacement of the labyrinth by a caseous or organized mass, as seen in Case 8.

The rapid erosion of the bone in the necrotic form and the infiltration of the tissues in the infiltrative form produce a facial paralysis much more often than do simple infections or infections of the lupoid or fungoid form. The paralysis in infants may be one of the earliest hints we have of any pathologic process going on in the ear. Alexander ascribes this to the frequent dehiscence of the facial canal, but others take issue with him and claim it is due to the peculiar pathology of these cases.

The diagnosis of these cases, outside of the history and physical findings, may be supported somewhat by the tuberculin tests and X-ray findings, but both of these are of minor importance. The tuberculin tests will be of more help in adults than in infants, where they are so often positive, regardless of an ear lesion.

Bernardini's work on the cytology of the secretions has become a classic, and his observation that the large mononuclear leucocytes are present in large numbers in tubercular middle ear secretions, lying in a clear, often fibrin holding serous fluid without pus corpuscles, is of immense value as an easy hint during our routine clinical work.

Of the complications of the disease, hemorrhages of the carotid and cavernous and sigmoid sinuses, sinus thrombosis and brain tubercle are rare, but labyrinthitis and meningitis are not infrequent. The labyrinthitis may be a tubercular process, as in Case 9; an acute suppurative process due to the mixed infection, as I suspect was the caes in the left ear of Case 7; or a plastic exudative process, in which case the deafness would be progressive over a long period.

The meningitis is, as a rule, a contact infection, as in Case 8. Briggs speaks of the possibility of an ear infection proceeding through the lymph channels from a brain tubercle, and it is interesting to note that Habermann[2] has since described such a case.

Concerning the prognosis in these cases, we would say that in our experience, in even the most hopeless looking cases, there is still a chance of an arrest of the local process; and in the lupoid cases in adults, an early surgical interference should be as successful as it is in ordinary suppurations of the ear. The necrotic forms in adults do not give as encouraging an outlook, as they appear in the advanced general tubercular cases, and any operative interference is poorly borne by such patients.

Since writing this article I have had the opportunity to study two cases of tuberculosis of the middle ear in which the lesions were principally apparent in the drums, and from which specimens were taken for pathologic examination.

Case 10.—Ed. C., patient in tuberculosis sanitarium, with a diagnosis of tuberculosis made microscopically from the sputum. One month previous he noticed a slight buzzing in the right ear. Since then a deafness has been noticed. Both deafness and buzzing have increased in intensity without any pain until one week ago, when he had a slight twinge of pain which lasted only a few hours.

On examination the right drum is found intact, beefy red, flaccid, bulging, hammer furrow noticeable, and arteries radiating over the surface. There is a slight moisture in the external canal. Weber to the right and watch heard at two inches.

One week later there was a perforation in the posterior inferior quadrant. One month later two small round perforations were present, the second one having appeared in the position of a former yellow spot on the drum. The secretion was minimal; patient did not know there was any; no pain. One month later the two perforations had coalesced and a part of the drum was removed, sections of which appear in Figures 3 and 4, showing typical fibrous tissue base infiltrated with lymphocytes and endothelial leucocytes. Definite tubercle with giant cells are seen scattered throughout the section; the whole shows evidence of degeneration.

Case 11.—W. B. Case in tuberculosis hospital with diagnosis of tuberculosis of the lungs. Came to clinic complaining of a ringing in the left ear; never any pain or discharge.

On examination the drum was found to be slightly yellowish red, not bulging, arteries markedly injected. The hammer was plainly visible; did not lie in a groove. One week later the drum was thickened, darker red and had two or three slightly yellow areas on the surface. A paracentesis gave no discharge, the needle passing through a thick surface into a cavity. The next day the opening had closed. One month later there was little or no change in the drum, and a piece was excised for examination. This relieved the ringing in the ear. The specimen showed the same fibrous struma as that of the former patient with lymphocytes and endothelial leucocytes, definite tubercle with giant cells and no areas of caseation. Figure 5 is taken from this specimen.

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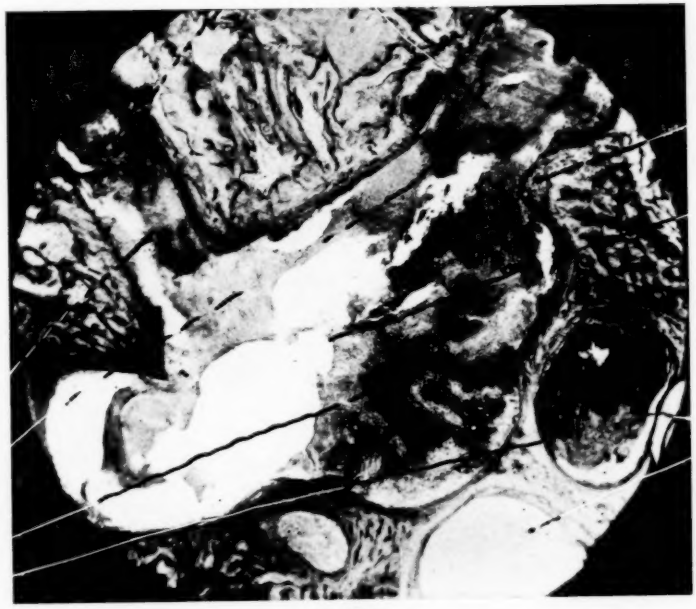

Semicircular Canals.
Figure 2.
Vestibule.
Cochlea.
Tubercular Deposit.

FIGURE 1.

FIGURE 2.

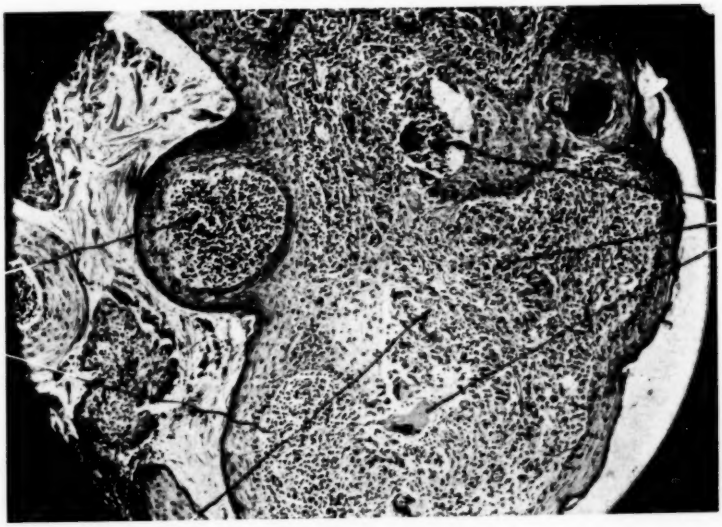


FIGURE 3.

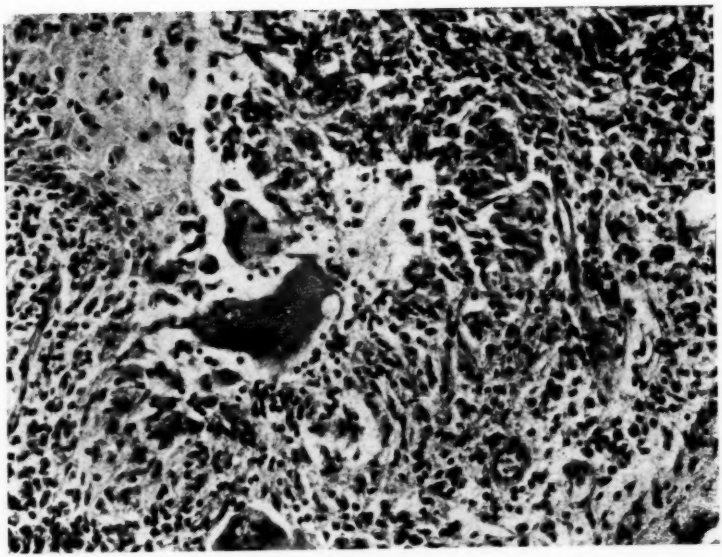
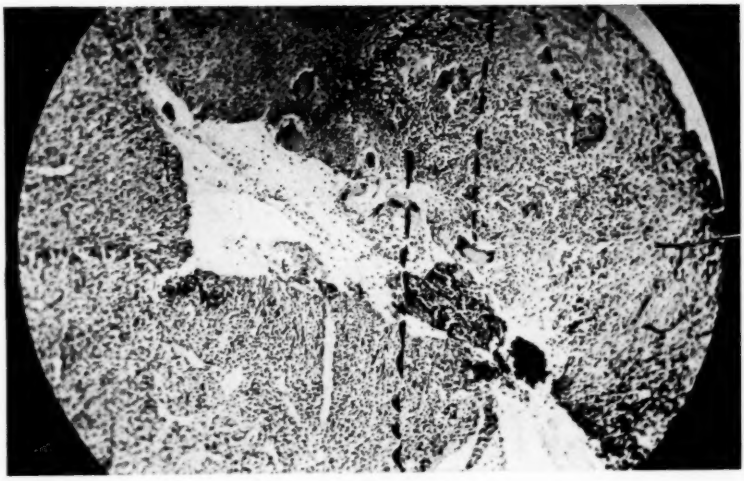


FIGURE 4.

Tubercles with
Giant Cells.



Fibrous
Struma

Lymphocytes.

FIGURE 5.

IV.

BILATERAL PERIPHERAL PARALYSIS OF THE MUSCULI CRICOARYTENOIDEI POSTICI.*

By H. Edward Miller, M. D.,

St. Louis.

In this part of the world it seems to me that laryngeal muscle paralyses are less frequent than in the parts of Europe where I have been a student (Germany, Austria, London and Paris). But even where such lesions are more frequently seen, a peripheral paralysis of the cricoartenoideus posticus must still be a rare lesion, judging from experience and recorded instances. In addition, the case that I have had the opportunity of observing possesses some remarkable features, notably that three separate acute attacks have occurred in the course of simultaneous acute laryngitides. From the first there was complete recovery, from the second a trace of narrowing of the glottis remained, and from the third a distinct permanent narrowing followed.

N. H. F., a German, thirty years old, a practioner of medicine, whose history in every way is negative, consulted me March 25, 1906, for what seemed a moderate grade acute laryngitis of grip origin. Within twenty-four hours appeared unequivocally a bilateral posticus paralysis, beyond question of peripheral origin, a part of the acute process in the larynx. He became unable to open his glottis, and the dyspnea which followed was very great. His cords stood less than two millimeters apart posteriorly. Arrangements were made for an emergency tracheotomy, which was finally omitted because he improved. As the acute laryngitis subsided his cords began to open, and in three months his glottis appeared normal. He remained well for about a year, when he developed another

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acute laryngitis with paralysis of both cricoarytenoidei postici similar in every way to his first attack, except that he did not develop such high grade dyspnea, probably because he then understood better how to care for himself. The second attack was in every way identical with the first, except that a small degree of permanent narrowing of the glottis remained. A third attack, similar in every way to the first and second, developed in about a year and a half. Resultant from the last attack, remained a definite permanent narrowing of the glottis which measured about thirty per cent of its breadth posteriorly. Throughout all of these attacks there was only a slight huskiness of the voice, associated with the utterance of a few words, and rapidly followed by a noisy, labored and lengthened inspiration. Expiration was always quiet. Moving about or trying to sleep exaggerated the condition. Dr. Greenfield Sluder saw him in the third attack while I was absent from St. Louis.

Since the last attack the patient has remained in good health. He has not manifested in any way signs of an organic central nerve lesion.

This case seems to me to merit whatever study may prove necessary for a satisfactory understanding of the various points of interest connected with it.

Anatomically the posterior cricoarytenoideus muscle is somewhat fan shaped, arising by a broad origin from the depression which marks the posterior surface of the cricoid cartilage on each of the crista. Its fibers converge in a direction upward and outward, to be inserted into the outer angle of the muscular process of the arytenoid cartilage. Its nerve supply is from the recurrent laryngeal, in common with the other intrinsic muscles of the larynx.

Functionally the cricoarytenoideus posticus seems to accomplish two results, one depending on its uncombined, simple action —i. e., acting alone—when it rotates the arytenoid cartilage chiefly around the axis of its saddle joint and at the same time slightly around its vertical axis. In this wise the processus muscularis is turned toward the median line and downward, and the processus vocalis outward and upward. During inspiration the cricoarytenoideus posticus widens the glottis, and performs a similar action when deep or soft tones are produced. In addition to its simple uncombined action, it may act

in combination with its antagonist, the cricoarytenoideus lateralis. When both muscles act together the rotatory action of each is counterbalanced, and there results the downward and outward pull along the diagonal joint surface, producing a widening of the rima.

The symptoms of cricoarytenoideus posticus paralysis are quite characteristic. Since both vocal bands assume the median position, the glottis stenosis becomes severe, and in extreme cases the median border of the vocal bands approximate during inspiration. This narrowing of the glottis is explained in various ways. H. v. Ziemssen,[1] F. Riegel,[2] E. Burow,[3] and F. Semon[4] believe it a mechanical suction of the bands due to a negative pressure produced below the stenosis owing to the widening of the thorax during inspiration. O. Rosenbach[5] and H. Burger[6] assert that also in quiet respiration the adductors are innervated after the paralysis of the abductors, and that then the impulses are only in the direction of the normal group of muscles. K. Gerhardt[7] thinks both explanations plausible.

The inspiratory dyspnea is ofttimes associated with stridor and sonorous inspiratory noises. The voice is slightly husky, while the utterance of a few words is rapidly followed by a noisy, labored and lengthened inspiration. Moving about or trying to sleep exaggerates the condition. Expiration is easy and noiseless.

The diagnosis of cricoarytenoideus posticus paralysis is made by the omission of its function from the living larynx picture. It being the only muscle which opens the glottis, the cord cannot be moved outward when this muscle is paralyzed. A distinction must be drawn between the picture resultant from an arytenoid anchylosis from perichondritis with a cord fixed in the middle line, and a cord in this position from inability of the muscle to move it outward. In the former instance the line of muscle tension will be unchanged. In the latter there will be slight sagging outward, or maybe only flabbiness of the line produced by lack of tension; although this will be less than in the total cord paralysis of a recurrent trunk paralysis.

It seems to me that the diagnosis must always be made by the laryngeal mirror, although F. Riegel[8] thinks it almost possible without this aid. "However, often in tabetics the inspira-

tory dyspnea may be absent, and the mirror must then come into play," he adds. The cord stands in the phonation position. It might be pushed into this position by a growth from below the level of the cord, or an interarytenoid scar might pull the cords together; but such sources of error ought to be easily recognizable, as a rule.

In the consideration of such a case comes at once into mind the law announced simultaneously and independently by F. Semon[9] and O. Rosenbach (1880),[10] which has since become known as Semon's law—that the fibers supplying the abductors are more vulnerable than those supplying the adductors. So far as I can learn, however, this law is for trunk paralyses. In fact, I am unable to make out from the literature on this particular point that there is recorded a case of peripheral posticus paralysis. It seems to me that all the material discussed is of trunk origin. O. Chiari[11] emphasizes the fact that he had never seen a case in which he could diagnosticate posticus paralysis as being of peripheral origin. H. Tilley[12] records a case where a peripheral posticus paralysis may have been the lesion; but proof was not at his disposal.

The trunk of the recurrent laryngeal, with all its collateral bearings, I believe, is certainly to be excluded from this case because of the history of the three attacks and the behavior of the case for the three years which have elapsed since the last attack, the patient remaining in perfect health.

The socalled hysteric paralysis can also be excluded, it seems to me, from the course of the case over these six years' time. Also that none of the means usually successful with hysteric paralyses have had any influence upon it.

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VI.

THE CORRELATED ACTION OF THE PHARYNX AND SOFT PALATE, AND ITS EFFECTS UPON POSTNASAL DIAGNOSIS.*

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By correlated action of the pharynx and soft palate must be understood the resultant action or effect of both the parts acting at once.

This district is complex anatomically, and serves in several functions—namely, swallowing, gagging, vomiting, sneezing, sucking, coughing, snoring, breathing, speaking, and singing—each of which is complex physiologically. My concern here is with the nasopharynx and oropharynx, and the functions of empty swallowing and gagging.

The simplest conception of the district, it seems to me, is that it resembles a soft walled tube, wanting in large part in front, where the soft palate, acting as a flat valve, divides it into a nasopharynx above and an oropharynx below. The upper outlet is fixed bone and divided in the choanæ by the septum nasi. The deficiency below is the posterior outlet of the mouth. The action of the tube in swallowing is a vermicular contraction from above downward, the anterior lower deficiency being closed by the tongue, which moves backward and upward, while the palate closes off the upper part. In ordinary swallowing a gentle degree of musclar contraction is used. In gagging the vermicular action is from below upward with the strongest contraction.

In or upon the posterior wall (pronounced in children), above the soft palate, is placed the pharyngeal tonsil, increasing in front to back measurement from below upward, its uppermost part a free surface, somewhat shelf-like, almost touching

*Read before the American Laryngological Association, May 25th, 1915.

the basilar process of the occiput; or it is a little further removed from it, according to the degree of swelling or shrinking which has gone on in it. Laterally, below the soft palate, are placed the faucial tonsils, varying in size and degree of imbedding. They are nearly always limited below by their junction with the lymphoid tissue at the lower lateral aspect of the tongue, which is a rather constant point. Their limitations above are less constant.

Two types of tonsils may be recognized—one placed free ("unattached" or "nonadherent") between the pillars of the fauces; the other placed deeply (imbedded) between them, little if any of its substance protruding "free" into the pharynx. According to the degree of enlargement of the organ, either of these types may rise into the mobile palate, even to meeting in the median line, compressing the uvula between them or crowding it forward and upward. When this is true, the upper lateral limit of the tonsil mass rises often to the junction of the upper and middle thirds of the palate; but this is less apt to be true for the free tonsil than for the imbedded one. The large "free" tonsil may lie under the palate arch in equal volume, but will push up the arch itself rather than ascend within it, which makes it (the arch) look higher, if not stand actually higher.

Just above the palate and slightly posterior to the middle line of the tonsil is found the cartilaginous mouth of the eustachian tube, which varies in size, prominence and position; being small and flat, or large and protruding one-half to one centimeter into the pharynx; or rising as high as the middle turbinate. Posterior to the mouth of the tube is the recessus pharyngeus (fossa of Rosenmüller), which may be scarcely at all marked or may be one and a half centimeters deep and one centimeter wide, extending outward and backward.

The free margin of the vomer begins below at the posterior limit of the hard palate and may rise straight up or pass upward and backward at an angle of forty-five degrees. The angle of the choanal plane is determined by this angle. Its vertical measurement varies from one and one-half centimeters to three and one-half centimeters approximately.

The plica septi varies in size and position, extending slightly beyond the free margin of the vomer; or is placed well forward of this, and sometimes higher or lower.

The soft palate is rather constant in length from its junction with the hard palate to its lower margin, but varies from two millimeters to one centimeter in thickness. The uvula and tongue vary greatly in size, and may play a part in correlated action.

The dimensions of the pharynx at the level of the palate may be five centimeters laterally, by two and one-half centimeters anteroposteriorly, which is the largest pharynx I have seen. Luschka[1] gives those measurements as normal. From my observations the average measurement in what seem normal adults in life is only about one-half of that size, and it seems to me that those measurements may be further reduced by one-fifth in what must often be admitted as normal. Such, however, must be considered a "small normal" pharynx. It may be narrowed to obliteration by enlargement of the structures found in it. The circular measurement of this plane may be greatly lessened, without the soft palate being shortened as it might be, were the simple requirements of the flap valve followed. It seems its length is determined by something else than its functional needs. Its elasticity may vary.

I have thought it of interest to know, for clinical use, what happens in the nasopharynx during the acts of empty swallowing and gagging, and to this end have conducted in a desultory fashion a number of experiments extending over thirteen years' time. No way was known to me by which these functions could be observed directly; and even now, with the help of Holmes' nasopharyngoscope and the X-ray, it still seems impossible. The X-ray of a bismuth bolus being swallowed shows its upward and backward, or its directly backward, course after passing the hard palate; but otherwise does not help. Einthoven[2] has given an extensive bibliography of writings on the physiology of the pharynx. But the particular type and purpose of the observations now to be described I fail to find recorded.

For my purpose I have tried many pigments to see if one could be found that would mark the surface wherever it touched, when placed on the upper surface of the soft palate in liquid form, one or two drops in volume. Two qualities were necessary in it—namely, that it should adhere readily to the membrane, and contrast sharply with it. These were found in a mixture of bismuth subcarbonat or hydroxid.

Nitrat of bismuth is dissolved in dilute nitric acid and mannite (about two per cent) added. To this is added a solution of carbonat or hydroxid of soda to neutralization. The precipitate is washed free of salts and allowed to settle, or centrifuged to the thickness of buttermilk. It is opaque white, contrasts sharply with the red of the membrane, and adherent to it under all conditions sufficiently to permit of any desired observation. Liquid India ink* may be used as a black pigment. A drop or two of the liquid is introduced through one nostril by means of a small caliber cannula and syringe, to arrive at the upper surface of the soft palate at a point in the center line of the choanal outlet. In a normad adult pharynx it is, upon swallowing, found spread over its posterior wall as high as the lower margin of the eustachian tube, usually equally on each side. The mouth of the pharyngeal bursa is below this level. In this way I have seen pus, secreted by the antrum of Highmore in small amount, come into the nasal fossa in some way that eluded detection, reach the soft palate from the floor of the nose, and be habitually absent from the nasal fossa, to appear spread over the mouth of the pharyngeal bursa simulating Thornwaldt's[3] disease. The soft palate acted as a trowel and spread the pus there as a mason spreads his mortar with his trowel. Inasmuch as no pus could be found in the nose, this deception was complete for some time. In this throat, gagging would have spread the pus in the same general way a little higher up. This effect, however, may be reversed. Instead of the pus being spread from the floor of the nose and soft palate, upward and backward, it may enter the nose from behind and above, and be wiped off the posterior pharyngeal wall to appear only upon the upper back part of the palate. Its origin then may be difficult to trace. In order that this may happen the throat must be narrow in anteroposterior measurement, regardless of what may be its lateral dimension.

Should the tonsils be small or absent, the loss of their pushing upward effect results in a lesser ascent of the palate. For the highest trowel effect in the nasopharynx the presence of the tonsils, to a greater or lesser extent, is necessary. The mouths of the tubes may or may not assist in this by the coming for-

*Draughtsman's India ink is sold in the American markets in liquid form.

ward of the posterior wall of the pharynx to meet them, thereby obliterating the recessus pharyngeus. In a pharynx with small tonsils and small tube mouths, a drop or two of the bismuth mixture introduced to descend over the lateral aspect of the end of the lower turbinate will, in swallowing, be found spread on the lateral half of the posterior pharyngeal wall of that side at about the level of the lower part of the mouth of the tube. at about the level of the lower part of the mouth of the tube. In the production of this picture the tube's mouth is set in the normal position—that is, there is approximately one-half centimeter free space between the tip of the turbinate and the cartilage of the tube; with like space between the floor of the nose and the cartilage, and like space in the recessus. The tonsils must be normal. Should they be large and rise high the pigment will be spread to a higher level, as they, also, are carried up in the rise of the palate and are assisted in this by the base of the tongue.

In gagging the contraction of the constrictors may be so strong that in a smaller throat the posterior wall of the pharynx is brought forward to the limit of the hard palate, and the lateral walls approximated. At the same time the soft palate is forcibly elevated to a considerable degree above the level of the hard palate, sometimes dimpling one centimeter above it. It should be recalled that the thickness of the soft palate is an average of about one-half centimeter, and frequently twice that; so this must be added in estimating, from below, the ascent of its upper surface. When the lateral walls are approximated and the posterior wall brought forward, and the palate is, as it were, stuffed upward into this narrowing gap, as happens in gagging, it is found that in the small normal throat the nasopharyngeal space is annihilated, as may be shown when a drop of bismuth mixture is placed near the center of the upper surface of the soft palate and gagging induced. The resultant picture shows the pigment to have been spread by a general approximation of the surfaces—that is, to be generally distributed—including an application to the free margin of the vomer. The angle of the choanal plane will play a part in this. This effect cannot happen in a large normal phraynx, or one of small normal caliber, but of unusual height, with a vertical choanal plane; for the tucking up of the palate is a necessary part, and it cannot be tucked up beyond its own length.

The parts of such pharynges cannot all be approximated, but with their diminution in size it becomes more and more easy, until it comes to pass in a small pharynx with normal swallowing. In this way I have seen seropus spread by the palate from the center of the floor of the choanal outlet, backward and upward, and lose all index to its origin. I have also in this way seen small amounts of seropus, entering the nasopharynx from above, wiped away and so spread out as to elude recognition. And I have often seen a sphenoidal discharge, profuse and purulent, wiped off the posterior wall, leaving no index to its origin, adhere to the palate and be raised over the tube into the middle meatus. At other times I have seen a small streak of thin pus, descending on the free margin of the vomer, wiped away by the palate and elude further recognition.

In considering diminution of size in the pharynx I feel that the means by which this may happen should be noted. A small pharynx may be part of a general diminutive state—e. g., childhood; or the older pharynx may be encroached upon in several ways. The pharyngeal tonsil may exist in greater or lesser bulk, narrowing its upper part from behind forward. The faucial tonsils may be enlarged, narrowing it laterally. I suggest scrutiny of the imbedded type, which may be large and not protrude beyond the surface. They are sunk into the walls and become evident only in gagging. I believe this type to be more potent in producing these effects than the prominent free one. It seems with the help of the tongue more efficacious in crowding the palate upward and backward. In gagging the tonsil masses are carried markedly upward in the strong upward pull of the palate, while the posterior wall comes forward.

The mouth of the tube—in usual position and environed by normal turbinates—permits pus, flowing backward out of the middle meatus, to descend over the lower turbinate between its tip and the mouth of the tube. The act of swallowing will then spread the pus or pigment on the same side of the posterior wall to about the level of the lower limit of the mouth of the tube or a little higher. In gagging, under these conditions, the pus or pigment may be transferred from the lowermost lateral point of the choana of one side to the uppermost lateral point of the opposite side—namely, the lower part of the sphenoethmoidal recess. This happens probably only when the contraction is strong in the obliteration of the last of the

already narrowed space, after the palate has been forcibly elevated in a pharynx that is certainly not taller than normal (rather shorter).

The tube may be placed downward and forward of its usual position. Pus then proceeding backawrd from the middle meatus may pass over the tube backward and downward by way of the recessus pharyngeus. This is made easier by swelling of the posterior tip. In this instance the narrowing of the nasopharynx in swallowing, combined with ascent of the palate, may in propitious throats convert the recessus into a tube, which will have its vermicular movement from below upward. In this way pigment may be transferred from the floor or middle meatus of one side to the upper meatus of the same side, and this holds true for pus also. It may also happen that pigment or pus descending in the recessus from above is at times stuffed into the middle or lower meatus, provided it be caught in the right way to reverse this effect. Many times I have seen seropus, entering the recessus from above, by the act of swallowing, wiped away or so spread out as to elude recognition. I have sometimes seen, in gagging, pus from one olfactory fissure smeared over in such a way as to simulate suppuration of the opposite fissure also.

But in the production of these phenomena there seems to be little or no constancy. Sometimes the pigment will adhere more to the anterior parts, and at other times more posteriorly. This irregularity seems true oftener for pigment than pus. Possibly a difference in the moisture of the parts at different times determines this. Bismuth may be used to produce one picture, and then India ink, at another or the same point. In this way two experiments may be done in a throat at the same sitting.

Observation upon the suppurations leads me to believe that their pictures in the pharynx may vary—that is, be different one time from that which appears at another time under similar conditions in the same throat. And furthermore, that these pictures are not the result of a single act of swallowing. They are not so easily or readily produced as to result from a single act. It seems to me that pus is less easily transferred than bismuth, and that many of the pictures we find are the results of a small volume of secretion and repeated swallowing —that is, that a small amount of secretion is each time put into

its unnatural position, and that the picture we see is the accumulated result of many acts of swallowing. Should the patient gag repeatedly in process of examination, these phenomena may be thereby likewise produced. Observation on the cadaver as well as on the living has shown me, moreover, that pus may enter the pharynx from different parts of the nose and not appear at the sinus outlet where it enters. Thin secretion may descend from the sphenoid sinus on the septum nasi anterior to the plica septi and not be recognizable by any of our present modes of investigation. It reaches the soft palate, below, and is then spread by its trowel action in such a thin film on the posterior wall that it is with difficulty or impossibly recognizable. The plica septi shuts it off from recognition by the postnasal mirror, and it cannot be recognized by the pharyngoscope. The anteroposterior distance between the osteum sphenoidale and the choanal plane varies much in different skulls. This explains how the last mentioned phenomenon may be a fact in some patients but not in all. The position of the osteum sphenoidale may sometimes be close to the median line, at other times placed far laterally.

A most elusive discharge is that which descends on the free margin of the vomer posterior to the plica septi, and is wiped off by the palate in swallowing.

The effects produced by a large tonsil on one side or a large posterior hypertrophy of one side may be calculated after one has done some of these experiments.

RÉSUMÉ.

To me it has been surprising to see the degree of narrowing (obliteration) that may take place in the nasopharynx in swallowing and gagging. This seems to have its limitations, however, in the soft parts. The elasticity of the tissues reaches a certain limit only. Therefore, when the distance between the posterior limit of the hard palate and the vertebral column is great—two and one-half centimeters, and the lateral measurement five centimeters—the combined narrowing effects are insufficient to obliterate such a large cavity in even the strongest gagging. The soft palate is not long enough to rise beyond the level of the tubes, and the loose tissue beneath the constrictors is insufficient to permit enough movement toward the center to result in approximation (obliteration).

But the degree of elasticity in the soft parts is practically constant. Therefore, when the nasopharynx is small either because of scant space in the bony skeleton or because of the size of the structures developed upon or within its walls, approximation of its surfaces (obliteration) is possible by the easy play of the muscles in swallowing or gagging. Naturally the smaller the pharynx the easier may it happen. In a cavity a little smaller than the normal, this would happen only upon strong gagging, and the pigment or pus would have to be in fair volume in order to be spread out; whereas in a small cavity a small amount of pigment or pus is spread out far, because the closing pressure is enough to spread a small amount over a wide area. This becomes easier until, in the small pharynx which one often sees in adults, not to speak of children, it may happen in tranquil, empty swallowing. The quality of the pus also makes a difference. Thick mucopus holds together and does not transfer readily, whereas seropus spreads easier.

Clinically, the understanding of these phenomena is of value —I believe especially so—when some other facts are borne in mind. In considering the transferrence of secretion from one place to another, thereby giving rise to clinical deceptions, it should be recalled that it requires a fluid secretion to permit of this, and that then it is easily done, and that the drier the district and the thicker and more tenacious the secretion the less likely it is to happen. Under the last conditions I have repeatedly tried, in vain, to bring it about. But of greater value, it seems to me, is to know the fact that by virtue of the power of the small pharynx to approximate its walls it possesses the power to wipe away small amounts of thin secretion from any point of the choanal plane, and even points forward of this (as may be shown by the bismuth being often put well into the meatuses). It is then so spread out over the general surface that it is lost from detection, and this may happen in the small pharynx in simple swallowing.

PRACTICAL APPLICATION OF THESE OBSERVATIONS.

Every rhinologist is familiar with the difficulties that attend the examination of some patients. Despite careful approach, every attempt to see the nasopharynx is followed by gagging, and even a palate hook in a small pharynx does not prevent

obliteration of the fault, the posterior wall coming forward. When it is recalled that this simple act may create deceptions in any one of the above enumerated ways, their practical value is self-evident, and when one remembers that in small throats these effects can be produced not only by gagging but by common swallowing, it becomes at once evident that there may be certain nasal disorders requiring diagnosis from the pharynx that may elude recognition indefinitely—i. e., sphenoidal (and postethmoidal) discharge of this consistency descending on the posterior margin of the vomer, or anterior to the plica septi, or in the recessus or near the median line. Such discharge often cannot be seen from in front, including use of Holmes' nasopharyngoscope; so that when it eludes the surgeon from the pharynx, the deception is complete, and I believe may elude him indefinitely. This secretion from the sphenoid looks like thin cow's milk. For experimental reproduction of sphenoidal suppuration of thin consistency I have used thin milk or thin bismuth. It is very easily visible at the time of its instillation, but the last trace rapidly disappears from sight in the nose, and from a pharynx that wipes itself in swallowing. I have seen it lost in three minutes and leave no evidence to the patient's sensation—that is, not be recognized as having flown into the pharynx.

In a recent paper dealing with obscure headaches, I emphasized the fact that sphenoidal inflammation could lose the classical picture—namely, the easy showing of pus at the proper point—and continue indefinitely, making headache, but eluding recognition locally.[4] This happens because the secretion gets thinner. The above observations bear directly on such cases. Shrewd observers have emphasized the difficulties besetting sphenoidal diagnosis—conspicuous and familiar to all of us is Dr. Casselberry's paper before this association in 1911.

When one bears the possibilities in mind—or, better still, will try the various nasopharynges experimentally—he soon learns to estimate—and I believe with reasonable accuracy—the possibilities or probabilities of the individual one at the time of examination, and thereby may avoid some deceptions in the diagnosis.

In concluding, I desire to reiterate and emphasize that these effects can only very rarely be brought about in what I have

defined as the normal adult pharynx with the exception of a simulation of Thornwaldt's disease, where the trowel action of the soft palate can do this. Very rarely the soft parts may possess unusual elasticity or freedom of motion. Such conditions may make it possible for the normal adult pharynx to approximate its walls not only in gagging but even in swallowing. Alterations in the form and size of the pharynx make the various deceptions possible, as herein enumerated. The pictures are produced with surprising clearness by bismuth or India ink, and much less so by pus. It is, of course, self-evident that pus at the classical sites, well forward of the choanal plane, with or without a clean pharynx, is of conclusive diagnostic value, and is uninfluenced by any of the above enumerated possibilities; but he who must needs have these classical pictures clear, before he can make the diagnosis, will have been eluded by other positive cases.

I believe, in a case where the history of nose disease is reasonably clear and the diagnosis very difficult, that it is at times distinctly helpful to know to what extent the nasopharynx is obliterated in swallowing and gagging. This would seem evident from the above context, and may be learned readily by the bismuth experiment.

The deceptions besetting postnasal diagnosis of the suppurations in children are largely, if not wholly, explained by these observations.

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VII.

TREATMENT OF HEMORRHAGE WITH NORMAL BLOOD SERUM.*

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The arrest of nonoperative hemorrhage, while not often coming under care of the otorhinolaryngologist, becomes a serious problem in the cases where total exsanguination is threatened as the result of incontrollable oozing from the mucous surfaces of the upper respiratory tract. A case of purpura hemorrhagica which came under the author's observation through the courtesy of Dr. ———, in whose service at the New York Postgraduate Hospital the author is working, together with two cases seen by the author and which were controlled by means of human blood serum, caused him to review the serotherapy of hemorrhage with special reference to its application in otorhinolaryngologic practice. As pointed out by Matas, this mode of treatment, while not specific in character, is based on a rational principle, and has yielded sufficiently encouraging results since its introduction to deserve further trial, not only in hemophilia, but in all the allied hemorrhagic states.

Serotherapy is based upon a physiologic observation that blood, having been rendered noncoagulable for experimental purposes, frequently recovered its coagulability when fresh normal serum from another animal was added to the contents in the test tube. Injections of fresh serum have since been found to possess a curative as well as a preventive value in the treatment of hemophilic bleeding, and it seems rational to resort to them in hemorrhage of any type. The organism in these cases endeavors of its own accord to increase the coagulability of the blood as a defensive act. The deficiency in the

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production of fibrin ferment in these patients is supplemented by introducing into the blood stream a substance in the form of a normal blood serum, which assists the organism to fabricate a new supply of fibrin ferment. The effect of the antitoxic serum is explained by the fact that fresh diphtheritic serum also contains the fibrin ferment lacking in blood with abnormal coagulation.

This method dates back some twenty years, when serotherapeutic measures were employed, although in a somewhat empirical and rather desultory fashion. The most brilliant modern results are probably those reported by Welch, who states that the subcutaneous injection of normal human blood serum will control the hemorrhagic diseases of the newborn in practically all the cases.

A brief review shows that in 1897 Bienwald, in Germany, succeeded in arresting by means of fresh serum a traumatic hemorrhage in a three-year-old hemophilic child. About the same time a case of purpura cured by fresh serum was reported by Felz and Pigot, in France; and in 1898 Fry, in this country, reported three cases of hemophilia in three brothers who were successfully treated with injections of horse serum. In 1907 Weil, in Paris, published his studies of hemophilic blood and the effects of serum treatment. He originally used fresh beef serum (now abandoned), fifteen cubic centimeters of which he injected into a woman suffering from purpura, subconjunctival hemorrhage and hematuria. The patient left the hospital well, but suffered a severe reaction after the injection, with chills, fever and vomiting. In the case of an alcoholic having chronic purpura with almost continuous hematuria, three intravenous injection of fifteen cubic centimeters beef serum controlled the purpura eruption and hematuria. Another case, a boy of nineteen years of age, with profuse epistaxis and hematuria, was given an injection of ten cubic centimeters fresh rabbit serum, which promptly checked epistaxis and diminished blood in urine. These observations were followed by many others.

To Weil is due credit for pointing out the prophylactic value of serotherapy. This preventive action is obtained from twenty-four to forty-eight hours after the injection, and persists for at least three weeks, often lasting two or three months, when the blood will be found to have again the former anom-

alies of coagulation. This point is of special importance in operative work on patients having hemophilia or purpura (manifest or latent).

Fresh normal sterile serum contains all the desirable fibrin ferments for the arrest of dyscrasic hemorrhage, and nothing else. For this reason it would seem preferable to the antitoxic serum. The human serum used in cases reported by the author was obtained fresh from the laboratory of the New York Lying-In Hospital, and used within forty-eight hours. The method of obtaining serum is the same as that in use for obtaining blood for the Wassermann test. Apparently healthy mothers with history of previous normal pregnancies and children are selected. The serum is obtained by allowing blood to clot in test tube and decanting the serum. An observation by Dr. A. B. Davis of the staff was to the effect that the serum obtained by centrifuging blood was not as active as when allowed to clot in the test tube.

However, the use of the antitoxic serum in cases reported by Weil and others was followed by beneficial results and no sequelæ of any kind, either immediate or remote. Human, rabbit, horse and beef serum have all been shown to be efficient in test tube experiments, and yet some consider the superiority of human serum for the correction of blood anomalies as quite marked. According to Clowes and Busch (1913), human serum is in no way superior to that of a variety of animals, notably the horse. The health of the giver in use of human serum must be investigated, and some prefer a near relative of the bleeder. In an illustrative case reported by Traver, a child of five years, of hemophilic ancestry and himself a bleeder, bled profusely from a small wound of the tongue; horse serum injection negative. The hemorrhage was controlled at once by injection subcutaneously of twenty cubic centimeters of serum from the father's blood. Human serum has the great advantage of protecting against anaphylaxis, no matter in what dosage it is employed.

Normal serum possesses a natural stimulating action upon the various cellular elements, such as the leucocytes and red corpuscles of the blood. Animals receiving serum injections are livelier and more active sexually, and there is improvement of the muscular power. Welch emphasizes the nutritive value of homologous serum, and refers the favorable results to

the nutritive influence of the serum upon the endothelium of the blood vessels. The coagulation of the blood in hemophilic patients is not regularly accelerated through serotherapy, although the hemorrhages may be diminished, suggesting, perhaps, that the endothelial lining of the intima also plays a part in hemophilia. Serum, more particularly antitoxic serum, has been administered internally in milk. When used in this way, anaphylactic symptoms are less likely to result, and the introduction of colloid factors through the skin is avoided.

The possibility of transmitting syphilis must always be kept in mind, and this must be considered a disadvantage, and the only one. Rabbit serum is very slightly toxic for man, and can be easily obtained from the carotid artery under antiseptic precautions. The quantity obtained is only sufficient for one injection. Horse serum is obtained in large amounts, and seems to yield more uniformly satisfactory results than any other animal serum. Beef serum has a tendency to induce anaphylactic symptoms in the form of chills and fever, cyanosis, vomiting, headache.

For the checking of dyscrasic hemorrhages in an adult the intravenous injection of ten to fifteen cubic centimeters of blood serum has been used. In cases reported the subcutaneous use of twenty and forty cubic centimeters was employed, repeated in eight, twelve or twenty-four hours, depending on condition and results. Subsequent injections may be given over a period of several months. In children, half the dosage may be given and repeated as suggested. To obtain full therapeutic action serum older than two days should not be used. Serum should be kept in ice box and sterile.

Precipitated blood sera, in the form of serum powder, have yielded good results in hemorrhages after tonsillectomies and turbinectomies. According to Clowes and Busch, the serum powder has been applied as a local styptic to bleeding surfaces, and has also been used with apparent success as a prophylactic before operations upon the nose and throat. This is of special interest to the otorhinolaryngologist. Relatively large doses are given the day preceding and an hour before operation. Coagulose, now offered to the profession by Parke-Davis Company, and originated by Clowes and Busch, consists of precipitated normal blood serum, and is claimed to retain its active properties unimpaired for long periods of time. It

comes in the form of sterile soluble powder in a sealed tube. Properly prepared, it can be used subcutaneously as well as locally in its powdered form.

Different opinions prevail as to the efficiency of coagulin Kocher-Fonio, which has been employed with satisfactory results, according to Kausch, in Berne. The powder is obtained from mammalian blood. Coagulin acts through accelerating the normal process of clot formation, and was usually employed externally on cotton swabs soaked in a solution. It has also been used intravenously. No harmful results have been thus far observed. Albrecht recently reported its use in gynecologic practice. In order to guard against ever present danger of secondary hemorrhage after endonasal operations, Barth, in a recent contribution to nasal surgery, recommends the use of coagulin Kocher-Fonio, according to the following method: Immediately before use, ten per cent watery solution is prepared and sterilized. After operation the wound surfaces are moistened with solution. Hemorrhage is controlled in nasal, adenoid and tonsil cases. Can be used as spray. There are no after-effects, and the repair process, if anything, is hastened. Coagulin was also employed for hemostatic purposes by Dr. von Lang, Budapest. He used a twenty to thirty per cent solution, applied on a strip of gauze, for two or three minutes. There was no secondary hemorrhage noted, and it was especially useful in operations of septum, ethmoid cells and antrum.

Serotherapy has been used by Wirth as a local application. Horse serum was used to control hemorrhage from the nose and mouth of a newborn infant. The bleeding spots in the mouth were painted with swabs soaked in the serum, and two wet gauze strips were inserted very loosely into the nostrils, with the result that the hemorrhage stopped.

The immediate availability and the advantage of permanence of action must prove the value of dried serum. It is well to note, however, the occasional failure of both fresh and dried sera. Claybrook reports a case of a child, fifteen months old, dying from hemorrhage of the tongue following an accidental cut by the teeth. Normal serum was injected subcutaneously, and calcium chlorid was given by mouth.

The subject cannot be dismissed without reference to use of whole blood. The transfusion of whole blood has been

used both in this country and abroad. A physician in this state saved his daughter from bleeding to death in a post-operative hemorrhage following tonsil removal. All treatment failing, direct transfusion of whole blood from father to daughter was done, with resulting control of hemorrhage. Recent reports show the work being done to save life in cases of severe hemorrhage by Dr. Alexis Carrel, so adept in vascular surgery, through method of direct transfusion. The objections to direct transfusion given by Welch are, in addition to the technic difficulties of the procedure, the danger of hemolysis, thrombosis and embolism; all of these, save hemolysis, have been overcome through the simplified technic of Dr. Lindeman of New York. Before performing direct transfusion, in addition to negative specific findings, it is desirable to ascertain that the serum of the giver does not agglutinate the red corpuscles of the recipient, or vice versa. A serviceable method is recommended by Fischbein. The good result of direct transfusion in cases of hemorrhagic diathesis is explained by Duke, who found reduced number of platelets, the introduction of new platelets presumably supplying the necessary element. Cases reported by him showed relief from tendency to bleed in two cases of purpura hemorrhagica. Flörcken reports a case of dangerous hemorrhage from the nose, gums and gastrointestinal tract, in a woman, twenty-four years of age, without a hemophilic family history, in which, after all other measures had failed, including gelatin and diphtheritic serum, direct transfusion was employed with immediate and favorable effect. The donor was an older sister. In pernicious anemia, Flörcken found only transient benefit. In a case of melena neonatorum reported by Misenthal, direct transfusion arrested not only the hemorrhage, but created normal condition of the blood. It may be of interest to remember that according to Lindeman, direct blood transfusion is of benefit in septic patients, thus replacing elements that inhibit bacterial growth. Whole blood has been used subcutaneously.

Recently V. Horsley has suggested and used the application of living tissue to bleeding surfaces. This does not seem practical or necessary.

In addition to my review of serotherapy and direct transfusion, it has seemed advisable to add a few other recent cases illustrative of this line of treatment to those personally presented by me.

Case 1. Purpura Hemorrhagica.—Treatment, human serum injection. Male, aged forty-seven years. Admitted to service of ————, April 2, 1914. Severe bleeding from nose, ears and gums.

Family history: Negative.

Personal history: Inflammatory rheumatism, ten years ago. No other severe illness. Habits good. Lately worried and not sleeping well. Ulcer on right septum of unknown origin for several years. Nose bleed began two years ago; three attacks, severe, all from right side. November 12, 1913, eleven attacks in one week, controlled by (Dr. Spann) using adrenalin. March 13, 1914, slight attack. March 30, 1914, bleeding slow but persistent, from nose and throat and ears and gums. Spots appeared on body; later found to be subcutaneous hemorrhage. Hearing right ear affected.

On admission: Temperature, 104°; pulse, 104; respirations, 24. Bleeding from nose, throat, gums and ears. Purpuric areas on body. Throat culture negative to bacillus diphtheriæ; streptococci present.

Blood: Erythrocytes, 3,640,000; leucocytes, 11,400; hemoglobin, 68 per cent; polymorphonuclears, 81 per cent; lymphocytes, 18 per cent; transitionals, 1 per cent. Given forty cubic centimeters fresh blood serum in deep muscles of back; calcium lactat, grains five, every four hours.

Urine: Phenosulph. test: Amount secreted first hour, negligible; amount secreted second hour, 25 per cent. Total in two hours, 25 per cent.

Fragility of red corpuscles: Degree of hemolysis of corpuscles mixed with salt solution:

Percentage of salt: 0.3—0.35—0.40—0.45—0.5—0.6—0.7.

Degree of hemolysis: Complete—Complete—Moderate—Slight—None—None—None.

Fragility of cells not increased, but within normal limits.

April 3rd. Temperature, 103.4°; pulse, 92; respirations, 18. Bleeding intermittent, but severe all night. Severe hemorrhage early in the morning from mouth, nose and ears. Clot and bright red blood. Nine o'clock in the morning, forty cubic centimeters serum; still severe hemorrhage. Two-thirty o'clock in the afternoon, forty cubic centimeters serum, adrenalin packing of nose removed and replaced. Seven-thirty o'clock in the evening, still some oozing, but not as severe. Given fifty

cubic centimeters serum; sulp., grain one-fourth. Temperature, 104°.

April 4th. Oozing stopped; fairly comfortable night. Temperature, 103.8°. Two o'clock in the afternoon, twenty cubic centimeters serum. Urine negative.

Blood: Erythrocytes, 2,510,000; leucocytes, 14,600; hemoglobin, 42 per cent; polymorphonuclears, 89 per cent; lymphocytes, 11 per cent. Wassermann negative; blood culture negative; coagulation time, ten minutes.

April 5th. Temperature still high; some oozing; eye and face puffed; finger oozing; coagulation time, three and one-half minutes. Culture of throat showed bacillus diphtheriæ, and patient was given 10,000 units. No further growth found.

April 7th. Improving. Blood shows several myeloblasts.

April 16th. Continued improvement. Blood: Erythrocytes, 2,450,000; leucocytes, 8,400; hemoglobin, 43 per cent; polymorphonuclears, 80 per cent; lymphocytes, 18 per cent; transitionals, 1 per cent; mast cells, 1 per cent.

April 23rd: Discharged, cured.

Case 2. Control of Nasal Hemorrhage by Human Blood Serum.—Male, aged twenty-four years. Referred to author by Dr. ———— by telephone, stating case as desperate from four days' bleeding from nose. Admitted to hospital November 5th. Clots in nose and nasopharynx, ulcer right side septum. Given forty cubic centimeters fresh serum subcutaneously. Serum obtained from laboratory of the New York Lying-In Hospital.

November 6th. Apparently no fresh hemorrhage. Given forty cubic centimeters serum and repeated next day. The patient had an active tubercular process in lung.

November 25th. Dr. Murray reports no further hemorrhage, but notes immediate beginning improvement in patient's general condition following use of the serum.

Blood Report in This Case.—November 5th, coagulation time, ten minutes. Erythrocytes, 4,204,000; leucocytes, 9,800; hemoglobin, 48 per cent. Differential—Polymorphonuclears, 78 per cent; neutrophiles, 75 per cent, and transitionals, 3 per cent; lymphocytes, 22 per cent; large, 10 per cent, and small, 12 per cent.

Case 3. Alcoholic Cirrhosis Liver, Purpura, Severe Hemorrhage.—Male, aged fifty years. Was seen by author with Dr.

————————. On November 15, 1914, patient was seized with attacks of hemorrhage from nose following alcoholic excess. Bleeding continued for two days and was followed by hematemesis on November 18th and purpuric areas. On the 19th hemorrhage became alarming. Fresh serum was obtained from laboratory and forty cubic centimeters given at eight-thirty that evening. This was repeated on the two following days. There was no hemorrhage after the first injection. Lindeman speaks of the use of blood transfusion in cases of alcoholic cirrhosis of the liver with severe secondary anemia.

ADDITIONAL CASES.

Case of purpura hemorrhagica, treated by horse serum. Dr. Bodenheimer. Given ten cubic centimeetrs of horse serum and repeated. No return of symptoms at the end of three months.

Case of purpura hemorrhagica, with spontaneous bleeding from nose and gums, controlled by antitoxin serum. Dr. Goldstein.

Case of nasal hemorrhage following turbinectomy in a hemophiliac treated by injection of human blood serum. Reported by Dr. Linn Emerson. Man, aged thirty-one years. Use of antitoxin serum at first, but not controlled. Serum obtained from patient's brother and friend. Large amount used and extended period of time must be noted.

Morestin reports a severe and apparently hopeless case of purpura, in which the patient was actually brought back to life by two injections of twenty cubic centimeters of normal horse serum, according to Weil's method. Wilson reports a case of Henoch's purpura successfully treated by injection of human blood serum obtained from the father's blood. Obstinate epistaxis in a hemophilic boy, arrested by twenty cubic centimeters serum is reported by Lommel. Weil distinguishes two forms of hemophilia—the accidental or transitory, and the congenital. The anomalies of the blood in purpura seem analogous, although not identical, with those of hemophilia. The use of serum is followed by a diminution, but not a disappearance of the blood anomalies. The toxic factors continue to impair the blood in the progressive cases, and here the results of the use of serum are naturally only transitory. Welch

claims one hundred per cent cures in cases of hemophilia neonatorum at the New York Lying-In Hospital. Treatment should be begun at the slightest suggestion of hemorrhage. Epistaxis due to arteriosclerosis was favorably influenced by serum injections in the experience of Wirth, who reports a case of a male, aged fifty-seven years, in which serum injection and serum tampons to the nose were used. Ramond recommends serum injection in grave cases of hemoptysis.

Injection of blood serum as a prophylactic measure is taken up by Goldstein, who advocates the method as a most potent and valuable ally in the control of hemorrhage, and emphasizes its advantages. The coagulation time is systematically tested in each case of tonsil enucleation, and whenever it exceeds seven minutes an injection of serum is administered. Fleischer in 1911 spoke of the use of serum at the first Northern Otolaryngological Congress, held in Copenhagen. Dr. F. W. Hinkel of Buffalo reports a case of prophylactic use of serum preceding operation of adenocarcinoma of the nose in a patient with a history of repeated hemorrhages. The operation proceeded with an unusually small amount of bleeding. This case is quoted by Clowes and Busch.

RÉSUMÉ.

The evidence collected from the literature, as well as the experience from the three cases noted by the author, is predominatingly in favor of serotherapy for the control of hemorrhage, practically no failures having been reported when the serum was fresh and used in sufficient quantity in conditions indicating its employment. To the nose and throat specialist serotherapy presents a simple, efficient and harmless hemostatic agent—our salvation—in all hemorrhages which do not promptly come under the control of the usual methods, and to be used early before extreme loss of blood has occurred. The office and hospital equipment should always have a supply of precipitated blood sera on hand for emergency.

The fresh human blood serum is available to the author at all times through the courtesy of the staff of the New York Lying-In Hospital, to whom his thanks are due, as well as to Dr. ————————, through whose courtesy the author was able to present the first case.

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VIII.

THE SIMULATION OF PARANASAL SUPPURATIONS FOR TEACHING PURPOSES.*

By Greenfield Sluder, M. D.,

St. Louis.

Mr. President, I present to you a scheme for simulating the various suppurations of the accessory sinuses of the nose. So far as I am aware, such a one has not heretofore been used for teaching purposes. I submit to you the human adult cranium, which has been decalcified in ten per cent HCl (to facilitate dissection), the calvarium removed, the accessory sinuses opened by dissection from its cranial aspect (which in the decalcified specimen is easily done), and the lower jaw and tongue removed for reasons which will appear later. The specimen may not have been decalcified or may not have been hardened in alcohol or formaldehyd, according to your whim. It is then stained red in an effort to reproduce the color of the living tissues. This particular one was hardened in formaldehyd, and stained in ammoniacal solution with carmine, which I believe to be the best stain. Its subsequent preservation has been in a five per cent aqueous solution of benzoate of soda, which seems neither to soften nor harden the specimen that has once been thoroughly hardened by alcohol or formaldehyd. Should sodium benzoate be used as the primary preservative, it must be much stronger than five per cent solution, and even then does not answer the purpose at all well, because it does not harden it; but as a preservative for hardened macroscopic specimens it seems ideal, inasmuch as they do not mould or change by decomposition and may be handled in bare hands without corrosive effect on the skin. The jars should be kept covered. Uncovered jars develop a white mould should the solution be too weak. It does not, however, seem to injure the specimens. In warm temperatures this solution may slowly

*Read before the American Laryngological Association, May 25th, 1915.

soften specimens that were not thoroughly hardened. Should this happen the specimen may be rehardened by a little formaldehyd. It is then washed and reimmersed in benzoate solution.

The simulation of pus, a sample of which I submit for your observation, is the subcarbonat or hydroxid of bismuth held in suspension by the presence of mannite, an hexatomic alcohol. Nitrat of bismuth is dissolved in dilute nitric acid and about two per cent mannite added. Sodium carbonat or hydroxid solution is added to neutralization. The precipitate is washed and allowed to settle, or is centrifuged to the thickness of buttermilk. I have stained it by the addition of a slight amount of anilin yellow and methylen blue. This preparation may be diluted with distilled water to reproduce the seropurulent discharges, or may be centrifuged to reproduce the thicker purulent discharges. A drop of it is then introduced into a sinus which has been dissected open from its cranial aspect. It may be put into the sinus to overflowing, or into the normal outlet of the one that the experimenter may wish to demonstrate. The specimen is then observed as though it were the head of a patient in the erect posture, by means of head reflector, nasal speculum and postnasal mirror. The tongue and lower jaw being removed, makes this by far the easiest type for demonstration. Should the demonstrator desire to simulate in further verisimilitude, reproducing some of the difficulties that beset the examination of the living, the lower jaw and tongue may be left upon the specimen, the mouth pried open by a gag, and a tongue depressor put into service. The specimen is observed for the entrance of the drop which has been introduced from above. One may see it appear for the waiting, and my experienec is that the simulation of the clinical picture hereby produced is so true to life as to be astounding, and all the subtle variations may be reproduced by quantity of the "pus" mixture introduced, or its dilution. (Should the bismuth mixture dry in position during the course of the demonstration, it may be dissolved by immersion in ten per cent HCl; or it may be left in its position as a permanent demonstration.

This sterile and permanent preparation stained to simulate pus may be utilized upon the living in the clinic for more advanced students by the simple introduction of a drop or two through a slender cannula at the various points at which appear clinically the sinus suppurations.

IX.

CLOSURE OF POSTAURAL OPENING FOLLOWING SCHWARTZE-STACKE OPERATION, BY A MODIFICATION OF THE MOSETIG-MOORHOF METHOD.

By Hugh B. Blackwell, M. D.,

New York City.

The operation does not quite resemble the Mosetig-Moorhof operation. Dench describes a somewhat similar operation in his book on Diseases of the Ear, in his account of the Mosetig-Moorhof method. In the Mosetig-Moorhof operation a flap is mapped out, beginning two millimeters below the retroaural opening, slightly larger than the opening to be closed (Figure 2). This incision is carried through to the periosteum, and the flap so formed elevated from it; the edges of the postaural opening are now dissected back for a distance of two millimeters (Figure 1) and are sutured to the edges of our flap (Figure 3), which we turn upward into the postaural opening of the cavity, and the raw surface of the flap is directed outward. This raw surface is allowed to heal by granulation, or is subsequently grafted. The skin is now brought together over the denuded area from which the flap was taken (Figure 4).

In this particular case the flap was cut as in a Mosetig-Moorhof operation (Figure 6), but the edges of the opening to be closed, instead of being dissected back for two millimeters, were dissected back for three-eighths of an inch (Figure 5). The flap was turned upward into this opening, its skin surface directed inward, and sutured by one suture at the top opening (Figure 7). The edges of the opening were then brought together over the flap, bringing the two raw surfaces together (Figure 9). The skin was now brought together over the surface from which the flap was taken (Figures 8 and 10) as in the Mosetig-Moorhof operation.

The essential point of difference between the two operations is that at the conclusion of the Mosetig-Moorhof operation the raw surface of the flap is left uncovered, directed outward (Figure 3), and allowed to heal by granulation. In the case here described, the external raw surface of the flap was covered over by the skin of the surrounding tissues (Figures 7 and 9), the healing being more rapid, with a firmer resulting closure. At the conclusion of the operation the Schwartze cavity was packed with plain sterile gauze, per canal, care being taken not to roll up the skin edges of the inverted flap. An external dry dressing with bandage was then applied. The pressure exerted by the internal packing against the external dressing serves to hold the raw surfaces of the flaps in firm apposition.

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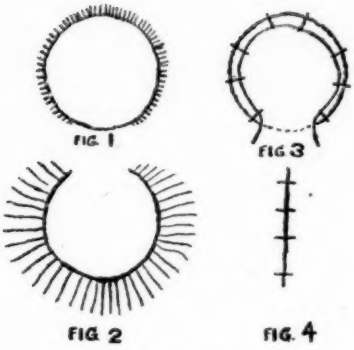
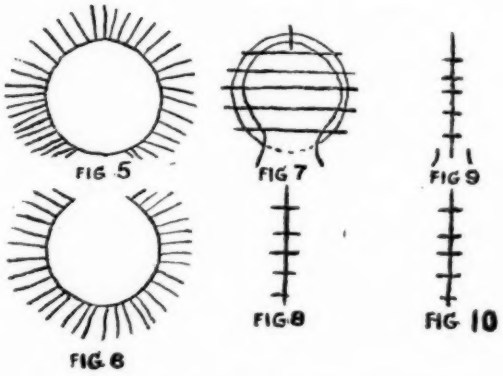


Mosetig-Moorhof Operation.



Modification of the Mosetig-Moorhof Operation.

The lines radiating from the margins of Figures 1, 2, 5 and 6 are intended to represent the extent of elevation of skin from the underlying tissues.

PROCEEDINGS OF THE

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

May, 1915.

Technic of Suspension Laryngoscopy, With Lantern Slides and New Instruments.

Dr. Robert Clyde Lynch presented his modification of the suspension apparatus of Killian, with the latest improvements which he has devised to overcome difficulties encountered with the older models. He described the technic as now employed by him. The chief modifications in the apparatus concern the traveling crane, the limited motion of which is overcome by his table top; the Killian hook, which he has so modified as to greatly increase its feasibility; the spatula, which was made of tool steel, so that it is perfectly rigid under the greatest strain.

With the table top with crane attached, arranged so that the base of the crane will be about four inches in advance of the shoulders, with a suction apparatus at hand to care for the secretions, and with the patient quiet and relaxed by a proper anesthesia—in other words, with the patient properly suspended—the operator has both hands perfectly free for the most accurate work upon the larynx. Instead of pulling, or pinching, or biting at the tumor mass, one can pick it out accurately and carefully . The laryngologist, with this method, can work in the larynx as the general surgeon works upon the skin, or the gynecologist works in the vagina. The gagging or other motion of the patient is practically impossible, for the larynx is immovably fixed.

DISCUSSION.

Dr. Robert Levy, Denver, complimented Dr. Lynch upon his work. Few laryngologists had the ability to apply suspension laryngoscopy as Dr. Lynch had done, or the skill to

devise methods for the improvement of the original technic, which was very unsatisfactory. He had been particularly interested in the tongue depressor, because at first this had been one of the difficulties, and to keep the tongue out of the way was one of the problems. The object of the original tongue spatula was to keep the tongue in the median line, to press it out of place, and at the same time to prevent the overlapping of the margins of the tongue. Dr. Lynch's instruments had entirely met these requirements.

Dr. Wolff Freudenthal, New York City, mentioned two cases that had come under his observation during the last two weeks which demonstrated the necessity for some form of suspension apparatus. The first patient had been sent to him from out of town. The man was suffering from tuberculosis of the right lung, was very much run down, and could not swallow at all. His physician wrote that unless the epiglottis, which was very much inflamed, could be removed, the end was near. The man's pulse was so weak that when he was carried to the operating room it was necessary to stimulate him for half an hour. Local anesthesia was employed, he was put under suspension, and the operation performed in the shortest time possible. The whole process healed within two weeks, the patient returned to the mountains, and was able to swallow food. His ultimate recovery, of course, was uncertain. The second case was that of a woman who had swallowed a fish bone. She went to a clinic near by, and the young intern sent her to the operating room, but failed to locate the foreign body, thought it was out, and dismissed the patient. Ten days later she consulted the speaker, at which time the entire left side was swollen, especially in the region of the arytenoid. Thinking she had an abscess, he made an incision, but got no pus. He put her under suspension, under general anesthesia, and removed the entire mass. The foreign body was not found, but the infiltration was extensive. When she recovered from the narcosis she became cyanotic from the blood running down, but this was removed, with some clots, and she recovered quickly.

Dr. William B. Chamberlin, Cleveland, mentioned a case operated upon by him last winter, shortly after his return from a visit to Dr. Lynch in New Orleans. The case was reported in the January number of the *Laryngoscope*. The patient was

a child eight months old, and had swallowed an open safety pin, which was removed without difficulty by the suspension method. He had had a second case in a child eleven months old, in which he had operated successfully by the same method. A third case was a baby two weeks old. The infant had just been removed from the maternity hospital, when the father came in and found the child choking. On looking into its mouth a large safety pin could be seen in the hypopharynx. When the speaker was called in he thought he was going to see a child two months old, and was discouraged when he learned it was only two weeks old. However, the pin, which was a very large one, was easily removed by turning under suspension. By any other method its removal would have been exceedingly difficult.

Dr. Arthur I. Weil, New Orleans, had seen a good deal of Dr. Lynch's work, and had done a good deal of suspension work independently. He could personally testify to the value of the innovations Dr. Lynch had introduced. He called especial attention to the value of this table top with suspension. He had formerly employed suspension with the crane attached to the head of the table, but the work was not nearly so satisfactory as with this extension table top devised by Dr. Lynch. The examination was rendered very much more reliable by this means than where one had to rely upon the screw of the suspension apparatus itself.

Dr. John W. Murphy, Cincinnati, mentioned a case which he had expected Dr. Lynch to operate upon on a proposed visit to Cincinnati. The patient's condition, however, became so bad before Dr. Lynch arrived that it was necessary to give him relief. He was a boy twelve years of age, with a papillomatous growth which almost occluded the larynx. It was necessary to resort to tracheotomy and the removal of a sufficiently large portion of the papilloma to enable the boy to breathe. Several weeks later Dr. Lynch succeeded, by his method, in cleaning out the rest of the papilloma. It was interesting to note the number of onlookers who could see almost every manipulation which the operator made in this larynx. In a week's time this boy was up and able to return to his occupation as a jockey.

Dr. Lynch, in closing the discussion, referring to the question of anesthesia, said he preferred general anesthesia, with

ether. Warmed ether vapor, as delivered by one of the new methods, had proved very satisfactory. On a recent visit to New York City he had had the pleasure of operating upon a patient under rectal anesthesia, administered by Dr. Gwathmey. He had had no other experience, but in this case the method worked admirably. There was complete muscular relaxation, the amount of mucus was less than usual, and the exhalation of ether from the lungs was hardly perceptible. He liked to work under cocain analgesia in patients who were not afraid. Morphin and scopolamin were given first, then a solution of twenty-five per cent cocain in fifty per cent alcohol was employed. One or two drops of this solution in the hypopharynx and on the laryngeal face of the tongue, then one or two drops of an aqueous solution of cocain into the larynx, had given good results in his experience, enabling him to work for an hour or an hour and a half without difficulty. The suction apparatus which he used was a dental vacuum apparatus on an ordinary turbine pump, with a long tube which could be run down into the larynx and trachea for the purpose of removing clots or blood or anything else. After the patient had been under suspension for twenty minutes or half an hour, thick, ropy mucus accumulated in the pharynx, and this should be removed before the patient was taken from the suspension apparatus; otherwise this mucus would drop down into the larynx and choke the patient. He had never had vomiting under suspension.

The Tonsil Operation—An Inquiry Into the Actual Results Observed in a Series of Cases.

Dr. D. J. Gibb Wishart: Not feeling comfortable in permitting the enucleation of the tonsil in every child where operation appears to be called for, and yet not having been able to glean anything from the abundant literature provided upon the question, which would show him the proper course to pursue, the author set out upon the examination of cases which had been operated upon since he adopted the enucleation method, ten years ago. He hoped thus to arrive at some data which would enable him to act with greater confidence, both with regard to his private clientele, and in the instruction of students. Letters were sent to each patient on the history cards, just as they came, and with no omissions or selections. All

cases which presented themselves were tabulated. The results were noted under the following heads: (1) Occupation; (2) sex; (3) age at time of operation; (4) years since operation; (5) previous operations, if any; (6) symptoms complained of; (7) effect of operation upon these; (8) anatomic conditions resulting from operation; (9) effect of operation upon voice; (10) effect of operation on general well-being; (11) symptoms unrelieved; (12) remarks.

The records compiled were from: private patients, twenty-eight cases in all, of which five were obtained by correspondence, and twenty-three examined personally in his office; those obtained from the hospital clinic, by Dr. McKelvey, seventeen in number. Because of faulty histories or the stupidity of parents, the records in the latter division were incomplete.

Sex and Age.—Three to fifty-two years, the cases being about equally divided between the sexes up to fifteen; after puberty, in the proportion of two males to eleven females.

Time Since Operation.—Average, five to seven years; no instance less than two years; in seventeen cases, eight years and over.

Effect of Operation Upon Symptoms Complained Of.—Not only were the symptoms (tonsillitis, ten cases; frequent colds, fourteen cases; enlarged glands, three cases; voice defects, eleven cases; swelling and aching throat, twelve cases; ear affections, ten cases; rheumatic symptoms, four cases; and headache, cough, enuresis, neuralgia, iritis, debility, restlessness, chorea, endocarditis, quinsy, dullness, etc., in one or more instances) complained of relieved, but it was notable that in nineteen cases the health was decidedly improved, and in no case was it deteriorated. The results of operation upon the symptoms actually present at the time when consultation took place were so uniformly good that the operation itself was justified. It was to be noted that in hospital cases where portions of the tonsil remained in situ, the effect upon symptoms was no better, if as good, as in private patients where enucleation was complete. It was not apparent that leaving a portion of the tonsils resulted in any benefit whatever to the patient, nor did the complete removal exert any deleterious effect.

Anatomic Results.—In patients from three to eleven years of age the results were apparently perfect in seven cases, the position of the palate normal in eleven cases, and in three cases there were minor variations which might or might not be con-

sidered as defects. In one private case a small patch of tonsil in the lower left sinus gave rise, seven years after operation, to swollen glands. In six clinical cases there were defects, chiefly the presence of small tags. In cases from twelve to fifteen years of age, results were apparently perfect in two cases; in one there was a marked variation in the curve of the palate arch; in one there was obliteration of the pillars, and in three there were scars.

In cases from twenty-one to fifty-seven years of age the results were apparently perfect in five cases. In three there were minor variations, not necessarily to be considered as defects. In four cases there were real defects. In the most seriously deformed of these last four the voice was definitely improved, and in one a good singing voice had been developed. In the cases in which the tonsil was extirpated in its entirety the anatomic results were undoubtedly best. In ten cases the notes failed to show whether there were adventitious bands of adhesion due to repeated attacks of inflammation in the tonsils, but the lesions of the pillars found present after operation could undoubtedly be ascribed to such a condition. The patients who had suffered from repeated attacks of tonsillitis were those in whom scars and malpositions were most numerous.

The effect upon the voice was carefully inquired into in all cases. Careful analysis of the results led to the deduction that the effect of extracapsular enucleation upon the singing voice or fatigued voice was not prejudicial, but might be considered beneficial.

General Well-being.—Practically every case was singularly corroborative of the view, long held, that the removal of diseased tonsils is attended by marked improvement in the general health of the patient.

Symptoms Unrelieved.—In fifteen cases these were mentioned. In three the nose was the seat of the trouble; in five the symptom complained of was aside from the question. In two endocarditis were noted; once as a new symptom, once as recurring in a postoperative attack. In one case nervousness and choreic tendency were thought to be independent of the original throat condition.

Remarks.—Under this head the author directed special attention to certain features of individual cases. The results of his investigation are presented in tabular form.

Partial Paralysis of the Soft Palate Following Removal of Tonsils and Adenoids. Observations on the Tonsil and Adenoid Operation.

DR. DUNBAR ROY: The patient, in the case reported, was a male, four and a half years of age, operated upon in the hospital May 20, 1913, for removal of tonsils and adenoid tissue in the nasopharynx. Complete removal was accomplished without trouble and with less traumatism than usual. Two days later the patient was out playing, with no signs of bad after-effects. The throat was not painful on deglutition, and there was but a slight amount of exudate in the tonsillar cavities. Ten days after the operation the child was taken to the writer's office with the history of having, two days before, a temperature of 101°, some malaise and some inability to articulate distinctly. In attempting to swallow liquids some of the fluid came back through the nose. Two days before noticing these symptoms the child had been allowed to eat an excessive dinner.

Examination showed the pharynx and nasopharynx to be in good condition, with only slight signs of inflammation. The tonsils had been thoroughly extirpated, and both pillars appeared normal. There was no pain. The tongue was white and coated. When the patient talked there were all the signs of paresis of the soft palate, just as is frequently seen after diphtheria. The family physician expressed the opinion that the paresis was due to intestinal toxemia. Laxatives, strychnin, light diet and irrigation of the nasopharynx with alkalin solutions, followed by touching with a solution of argyrol, brought about prompt improvement in the local and general condition, and the child was soon apparently perfectly well, except for the voice and a leathery appearance of the soft palate. The patient continued to improve, but it was nearly two months after the operation before the voice was practically normal.

The ill effects upon the throat following the radical removal of the tonsils and adenoids have been commented upon by many observers, but the author had encountered no mention, in the literature of the last few years, of the sequela of partial paralysis of the soft palate. Inexperienced operators, obsessed with the idea of radicalism, have caused much damage to throats which would otherwise have been better had they never been touched. Operation for the removal of tonsils and

adenoids should not be looked upon as a simple procedure, but should have the same thought as any other major surgical operation. The operator should find the one technic which gives him the best results—that which leaves the throat in as normal a condition as possible—and should adhere to this in all his operations.

In the case reported, the only one the author had ever seen, owing to the fact that tonsillectomy and adenectomy were both performed, it was impossible to say which operation was the cause of the paresis. On the other hand, it might be argued that the paresis was accidental and entirely independent of the operation, especially since cases of paresis of the soft palate had been reported as being one type of chorea. The fact that the paresis occurred ten days after operation did not entirely exclude the condition as standing in the light of a propter hoc. His own opinion was that the paresis followed the adenoid portion of the operation, and that infection was the result of a traumatism on the posterior surface of the soft palate, which was manifested by the thick leathery condition found ten days after operation.

In the light of this experience he was convinced that operators too frequently use an unnecessary amount of force and traumatism in the removal of adenoids, especially in very young subjects, in whom the nasopharynx is very small. In the case reported he used small sized Brandage forceps for the removal of the adenoids. Since that time he had abandoned the forceps in this operation, because of the danger, in opening the forceps in the nasopharynx of small children, of traumatism of the soft palate. The La Force adenectome, without the large anterior bulbous portion, followed by the use of small Gottstein curettes, was, to him, the ideal operation.

The author gives the replies to the inqury, "Have you ever seen a total or partial paralysis of the soft palate following the removal of the faucial tonsils, nasopharyngeal adenoids, or both?" which he directed to fifty members of the society.

DISCUSSION.

Dr. George L. Richards, Fall River, gave briefly a review of one hundred and eighty-eight cases in children operated upon by himself and his associates during the last two years. It was found that the result was good in one hundred and forty-

four cases, or seventy-seven per cent. By good he meant that the anterior pillar was there as a folded-over pillar, and not as a narrow line. The result was fair in thirty-eight cases, or twenty per cent. By fair he meant that there remained some scars. There were six cases, or three per cent, in which the results were poor. The voice was very bad in two cases, in which the uvula was caught and in which there was a distinct scar. He thought these would have a nasal tone, but they sang the scale perfectly well. He had reports of some of the children covering two years. It was a curious fact that if the anterior pillar alone was injured and the posterior pillar was not, the child had a good voice. Of the one hundred and eighty-eight cases, twenty, or nine per cent, had scars. By scars he meant contractions in which a little line could be seen. There was a tendency on the part of nature to replace more or less lymphoid tissue, and this manifested itself in granulations in the pharynx. Many patients complained of this, which gave a "scrapy" sensation, especially in winter. There were forty-five cases, or twenty-five per cent, in which these granulations could be seen. The pillars were injured in twenty-three cases, or twelve per cent, some sort of a little nick or injury having been inflicted. It was very easy to leave some remnant of the tonsil; this had been done in sixteen cases, or eight per cent. There was no hemorrhage. The patients, operated upon in the morning, were kept in the hospital until afternoon and then allowed to go home. Whether complete mouth breathers or not, sixteen, or eight per cent, breathed through the mouth where a part of the adenoids had been left. In order to be absolutely accurate as to results with reference to the voice, one must make records of this before the operation. Five, or two per cent, of his cases already lisped.

Dr. Richards presented a plaster model of the pharynx, upon which he demonstrated the relationship of the tonsils and the pillars. After a perfectly satisfactory operation the anterior and posterior pillars should be distinct and not fused together.

Dr. William B. Chamberlin, Cleveland, considered any method of tonsillectomy good which removed the tonsil and nothing else. The structure most easily injured was the posterior pillar at the junction with the uvula. The posterior pillar, which was extremely delicate, could be torn, just as

could a piece of cloth. A quadrilateral palate might result. In his experience, as doubtless in that of others, disappointing results had been obtained in cases in which he thought the operative procedure absolutely perfect. This was due to the contraction of the scar tissue. He had never had an unsatisfactory result so far as the voice was concerned, not even for its finer uses, as by singers and public speakers.

Sometimes, in the removal of the adenoids after the tonsil operation, laceration of the posterior pillar was noted. This was the result of the gagging of the patient, plus the traction of the curette, thus causing injury to the pillar. It was important, after the adenoid operation, to palpate the nasopharynx to see that every portion of adenoid tissue had been removed. Injury to the posterior pillar might result from rough handling in the examination by the finger. If, with the adenoid curette, one continued the sweep too far downward, it was easily possible to strip off the entire mucosa of the posterior pharyngeal wall, leaving cicatricial tissue instead of healthy mucosa.

Dr. J. A. Stucky, Lexington, considered this study of the results of the tonsil operation very important. In his section of the country tonsillectomy was being performed not only by general practitioners but by general surgeons. In his college town there were several thousand students, and many teachers were constantly referring pupils to him for some defect in speech and vocalization. The society should go on record as advocating that the tonsil operation is not a minor operation, and that it is underestimated and underpaid. It should be considered as a hospital operation. Those who teach students should see that every step of the operation is seen by them. The point made by Dr. Chamberlin was a very important one. It should be done gently, however. The fingers of many operators were too large for this, and for that reason he advoctaed the use of a postnasal sponge holder, with which one could go in and swab out the pharyngeal vault as carefully as the gynecologist would swab the fundus of the uterus.

Dr. Wendell C. Phillips, New York City, referring to Dr. Wishart's statement concerning Case 12 of the series, that operation was probably done too late in life to be useful so far as hearing was concerned, said if seven years were added

to the patient's age it would then be time for otosclerosis to appear; besides, the mother had deafness. Earlier operation would have had the same result. So much had been said from time to time about the danger of removing the tonsils from singers, that he had become very careful in this regard. He had not had an extensive experience in operating on singers, but in every case in which he had removed the tonsils, not only had the voice not been injured, but it had been improved by the procedure. Within the last few months he had advised the removal of the tonsils from a man, a singer, a patient of Dr. Babbitt's, who had typical cheesy masses in the crypts of the tonsils. After being told that if he were to read the literature of the subject he would be discouraged as to the possible effect of the operation upon his voice, the patient said the effect of the tonsillitis on his voice was so bad that he might as well have the operation, as he would not sing much otherwise. Dr. Babbitt removed the tonsils and the man's voice was very much improved.

Dr. John F. Barnhill, Indianapolis, said it should be regarded as a settled fact that tonsils should be removed completely. He had been particularly impressed by Dr. Wishart's statement to the effect that imperfect operations were done abroad; that he had seen many of these cases, done in America, and had had to do the work over. The speaker had never regretted taking out tonsils completely whenever it was necessary to take them out at all, and he had always regretted imperfect work. He thought some of the symptoms mentioned following tonsillectomy were not due to the tonsils at all, but to some of the structures not removed. For instance, if any diseased portion of Waldeyer's ring were not removed, it would continue to become inflamed. The adenoid ring in its effects might be confused with the old trouble. The lingual tonsil became inflamed over and over again. There was an attempt on the part of nature to restore some of the tissue which had been removed, and there might be soreness of the lingual tonsil which did not exist or was not noticed before. He had seen paralysis of the soft palate following these operatoins, as suggested by Dr. Roy, and had considered it due, in some cases, to infiltration, and in some to traumatism caused by the finger in the vault of the pharynx, together with marked contraction of the soft palate. He had seen sloughing of the

uvula in some of these cases. He cited one case in which the uvula, which had apparently not been injured, sloughed away ten days later. No harm resulted from it.

Dr. Sidney Yankauer, New York City, agreed with the other speakers with reference to the importance of avoiding roughness in handling the tissues in tonsil and adenoid operations. Undoubtedly many of the bad results reported from time to time were due to this error of technic. It was not difficult to imagine the amount of injury that might be done by an inexperienced operator with a rough gauze sponge rubbed about in the pharynx. For a number of years he had used a suction apparatus for the removal of blood and mucus from the throat, thus eliminating all traumatism. He had discarded gauze sponges entirely; whenever it was necessary to use any sponges, he employed soft sea sponges. In this way he had been able to avoid all traumatism, and the patient could take a full meal in from twenty-four to forty-eight hours.

Dr. James F. McCaw, Watertown, cited a case called to mind by Dr. Roy's paper. The patient, a little girl, five years of age, had paralysis of the soft palate immediately following the adenoid and tonsil operation. He had attributed it to his overzealousness in attempting to rid the child of every vestige of adenoid tissue by using an overlarge adenotome. The paralysis lasted seven or eight months.

Dr. G. Hudson Makuen, Philadelphia, wished to say a word in his own defense, inasmuch as reference had been made to something he had written bearing on this subject. One thing upon which he had ceased to speculate concerning the tonsil operation was the idea that the mere removal of the faucial tonsil injures the voice. When the removal of the faucial tonsil was absolutely indicated, and when it was properly removed, no injury could result. When its removal was indicated, the tonsil itself was a menace to the voice. The thing that injured the voice was the faulty removal of the faucial tonsil or the adenoids. An operation which tended to paralyze or to mutilate the soft palate, must of necessity injure the voice. An important thing in this connection was what might be called the musical instinct. If a singer had a musical ear and a musical brain, he would sing fairly well even with a damaged pharynx. Just as good violinist could make good music on a poor instrument, so a good singer could have a good voice with an indifferent vocal instrument.

DR. GEORGE F. KEIPER, Lafayette, had two cases of paralysis of the soft palate following the tonsil and adenoid operation, due, he thought, to the use of the palate retractor—or protractor, as this instrument should be called. If in inserting the finger one would hug the posterior pharyngeal wall, he would not be apt to injure the soft palate, even if the patient gagged. He had abandoned the use of the retractor.

DR. CLIFTON M. MILLER, Richmond, emphasized the importance of warning patients who sing not to begin to use the voice in the higher registers too soon after the tonsil and adenoid operation. He cited the case of a young lady whose tonsils he removed, warning her not to use the voice in the higher registers for six weeks, but to confine her use to the middle or normal registers. At the end of three weeks she felt so well that she began to sing in the high registers, and her voice broke. The mental effect was so profound that instead of being able to use the upper registers in six weeks, it was six months before she could do so. The psychic effect on these patients, with their highly organized nervous systems, was apt to be very profound, and for this reason they should be emphatically warned.

DR. GREENFIELD SLUDER, St. Louis, emphasized the point made by Dr. Richards in reference to nature's attempts to reproduce lymphoid tissue after tonsillectomy. He called attention to the fact that the lingual tonsil gives rise to a lymphoid growth which extends into the tonsillar fossa and at times reproduces what is anatomically perfectly corresponding to the original tonsil and clinically takes on all of its pernicious activities. He mentioned also that in many cases pharyngitis lateralis was developed, also being at times clinically pernicious. Whether these reproductions of lymphoid masses be a part of nature's effort in healing, or whether they be a manifestation of continued diseased activities, is a question that he has not been able to solve. In the *Archiv. für Laryngologie*, for 1912, Dr. Oswald Lëvinstein described what he termed a new pathologic tonsil which developed in the lateral aspect of the tongue, just anterior to the palatoglossus fold. I have confirmed Dr. Lëvinstein's observations, finding this hypertrophy of lymphoid follicles massed together in such a way as to resemble a tonsil in cases of "painful tongue," the condition described by Sir Henry Butlin in his

monograph, "Diseases of the Tongue," in which the lymphoid follicles at the junction of the palatoglossal fold with the tongue proper were the only demonstrative lesions. Lëvinstein attributes this tonsillar development to irritation in the lymphoid tissue. This surely seems to be a development in a pathologic line.

He had also been interested in the question of the production of scars in the throat, and had frequently noted the quadrilateral palate mentioned by Dr. Chamberlin. This might occur, regardless of the method employed for the tonsillectomy, and comes to pass because of the fact that the operator cannot control the fixing or focusing of the scar which must needs develop. He thought it advantageous to focus the scar anterior and below to draw the palate downward and forward, which pulls it away from the eustachian tube above. He thought this to be a definite help in cases where the tonsil is removed because of the eustachian tube irritation. He did not believe, from an extensive observation, that this interfered in any way, shape or form with speech or the artistic use of the voice. He mentioned that he had dwelt upon this point (drawing the palate downward and forward) in his paper to the American Medical Association, in 1910, in which he described a "Method of Tonsillectomy by Means of the Alveolar Eminence of the Mandible and the Guillotine."

Answering a question by Dr. Richards regarding his earlier cases, Dr. Sluder explained that he had formerly considered the plica tonsillaris as a part of the pillar. It was with this idea in mind that he made the statement that he always removed a portion of the anterior pillar, which tended to fix or focus the scar downward and forward, and that usually a few muscle fibers were attached to it. The careful examination of hundreds of tonsils reveals that very seldom is much muscle fiber attached, and that with a little attention to this point the entire palletoglossus may be pushed aside and the plica, with the membrane covering it, removed, in no sense and in no degree injuring the pillar proper.

His ideas concerning the pillar and the plica are gained from the work of Dr. George Fetterolf on the "Anatomy of the Tonsil and Its Capsule," published in the *American Journal of Medical Sciences,* in 1912. Fetterolf's conception is that the plica tonsillaris is a fold of the capsule of the tonsil pushed

inward over the tonsillar mass, carrying a layer of mucous membrane with it, and that the pillar proper is constituted by the palletoglossus muscle. In other words, the statement made in the speaker's paper of 1910 was a confusion in the nomenclature.

Dr. Wishart, in closing the discussion, said he had not met with any continued paralysis of the soft palate after operation, and he had used the finger very largely; never, however, while the patient was retching. He always saw to it that the patient was in the proper condition of anesthesia before he attempted to remove adenoids. He would rather give a little more anesthetic than to run the risk of overstretching the soft palate. Many of the bad after-effects were caused by too much sponging. The assistant should stand in the right position with referenec to the patient, so that he could see the parts, and the sponge should never be turned round. He had merely cited Dr. Makuen's article and had presented these cases as notes upon it, not as a criticism.

Dr. Roy, in closing the discussion, said it had seemed to him important to bring the subject before the society, inasmuch as he had never heard of anyone, in the literature or otherwise, who had encountered a case of this kind, and that in writing to members of the profession he had found it much more common than he had imagined. He did not want to go into the matter of technic, or to advocate this or that method; he did say, however that one should not change from a well recognized technic, which one had used and knew how to use successfully, to a new method. In the majority of cases the operation was performed too hurriedly, often without stopping or waiting for the oozing, which frequently occurred, to cease, and without seeing just where the instrument was going. The correction of these errors in technic would lessen the number of traumatic and unsatisfactory after-results. He had never employed a suction apparatus, which, it seemed to him, sucked the blood out of the arterioles and veins and tended to keep up the bleeding. He operated slowly in doing tonsillectomy, and had very few drops of blood. A sponge put into the cavity and allowed to remain for a while would prevent bleeding. If, as Dr. Stucky had suggested, the operation were considered a major operation, always to be performed in a hospital, and if the operator were always careful to see the entire field

and to know just where his instrument was going, better results would be obtained than had been previously accomplished.

Some Investigations of the Salivary Glands in Health and Disease.

DR. THOMAS E. CARMODY: There is notable lack of literature on this subject, due to the rarity with which the salivary glands are affected, or to the fact that cases are not considered by observers as of sufficient interest to be reported.

Among pathologic conditions mentioned by the author as involving the salivary glands or ducts were mentioned: Calculus; injury to or stoppage of ducts by mucous plugs, constriction, or cicatricial bands; Miculicz's disease; tuberculosis; air tumors; new growths; chronic hypertrophy; atrophy; and congenital defects.

Mistakes in diagnosis of these conditions seemed to be the rule, probably due to the infrequency of most of them.

Was there any reason why the salivary glands are so free from disease? It had been suggested that these structures are more frequently affected in persons who are careless about their teeth, though this view could not be substantiated. A badly decayed tooth, however, was frequently found opposite the opening of Steno's duct in cases of disease of this duct or of the parotid gland. The rich blood supply of the tissues about the mouth could not explain the special immunity of the salivary glands; nor could the good drainage which characterizes the parotid, especially the superior portion, account for this relative immunity, because the submaxillary and sublingual are not so advantageously situated.

Although a good deal of work had been done to determine the protective action of the sulfocyanate of potassium, nothing had been definitely determined in this regard.

The continuous flow of secretion from the glands probably had as much to do as anything in preventing infection. But it must be remembered that in case of the kidney one would expect, on account of gravity, that there would be small chance of infection taking place by way of the ureter, and yet the kidney was probably more frequently involved than the salivary glands; in tuberculosis, for example, the kidney is affected twenty-five times to one of the salivary group.

The thought presented itself that the glands and tissues might be among the last to lose their vitality, a view which the

author believed to be true. It had been his observation, from a limited investigation with glands obtained postmortem, that patients who were very ill with various diseases digested starch at ordinary room temperature and at forty degrees as well as the control of presumably normal saliva. The starch test, while the best at hand, left much to be desired. This test is made with a one per cent paste, made by heating the required amount of starch with a little water, and adding enough water to make a one per cent solution. Of this solution the tubes are taken containing five cubic centimeters each, and one drop of filtered saliva is added at intervals of one minute; one drop of a N/20 iodin solution is added and changes noted. The first few tubes show blue, gradually becoming lighter until, at the end of ten minutes, a straw color was given. The blue color was due to the reaction of the starch to iodin; the gradual change to reddish is for the reason that the starch is changed to erythrodextrin, which gives a red color; and on further digestion, achrodextrin is found, which gives no color. This, however, will not be found for at least twenty minutes at ordinary room temperature, unless a large amount of saliva is added. If tested at forty degrees the change takes place more rapidly. No quantitative tests for soluble sulfocyanate have as yet been made.

The author reported fifteen cases of disease and injury to the salivary glands.

Review of the Most Important Recent Contributions to the Treatment of Diseases of the Ear.

Dr. George L. Richards presented abstracts of literature on the following:

1. Closure of eustachian tube during the radical operation.
2. Radical mastoid operation.
3. Operative treatment of otitis media.
4. Meningitis.
5. Vaccines.
6. Blood cultures.
7. Use of radium.
8. Salvarsan.
9. Hearing power of the vestibule.
10. New instruments.

DISCUSSION.

DR. FRANK ALLPORT, Chicago, said the radical mastoid operation, which was a serious procedure, should not be undertaken without careful consideration. The spoken and written contributions to the subject during the past two years had tended to mitigate the enthusiasm of a good many mastoid performers, himself among the number. All other means should be tried before resorting to operation. Even in the most skillful hands the operation was not always successful. Nevertheless, he wished still to go on record as holding that, if something must be done, if all other measures of a conservative nature have been exhausted, if the point has been reached where some surgical procedure must be recommended, nothing had been proposed which would take the place of the properly performed, old fashioned, radical mastoid operation. The conservative method, as advocated by Heath and others, had very few enthusiastic followers, especially in this country. He had been surprised to read, in a paper by Haskin, the statement, which Dr. Richards quoted, to the effect that the author had not performed a radical mastoid operation on a private patient for some time. He could not understand how a man who sees a great variety of cases could arrive at this conclusion. In dispensary practice, where patients could not be given the care that private patients receive, it was necessary to perform the radical mastoid operation, according to Dr. Haskin, who claimed that by means of his vacuum cleaner he could obviate the necessity of doing the radical mastoid operation. There seemed to be some divergence of opinion as to what should be done with the eustachian tube in the radical mastoid operation. So far as he was concerned, there seemed to be but one way, and he paid a good deal of attention to the closing of the tube. Kyle, of Los Angeles, in a recent article, advocated paying no attention to the eustachian tube. A case might be perfectly well in every other respect, but if there is a constant dripping from the eustachian tube, it was certainly not cured so far as the patient was concerned. If the eustachian tube was left untouched, the patient would still go through life with a discharge. He thought, therefore, that strict attention should be paid to the closure of the mouth of the tube, by the Yankauer or any other efficient method.

DR. THOMAS J. GALLAGHER, Denver, considered Dr. Yan-

kauer's contribution to the treatment of the eustachian tube, both in chronic suppuration and in stenosis, of great value. In the radical mastoid he had found this method very satsifactory. In many cases of chronic suppuration the closure of the tube would prevent a mastoid operation. However, it was not intended to take the place of the mastoid operation when the indications were clear for such procedure. He had found Yankauer's method extremely gratifying in stenosis of the tube, using, of course, the special instruments devised by him. In routine work the caliber of the tube should be known, and he had long since discarded the Toynbe tube with inflation to ascertain this fact. Even in cases of combined internal ear disease and tubal obstruction the tube should be made as patent as possible, which often improved the hearing, although the internal ear condition remained uninfluenced. In cases of chronic perforation often this could be closed if proper drainage is established.

Dr. E. B. Dench, New York City, referring to the question of bacteremia in sinus thrombosis, called attention to the point, not mentioned by the essayist, that in a certain stage of sinus thrombosis one should not expect to find bacteremia. In the development of this condition there was first the formation of the parietal clot. At first there was bacteremia; suddenly there was none, but the temperature continued. That meant that the clot formation was continuing. After two or three days the blood was again filled with bacteria; that meant that the clot was breaking down. He cited a case in which the sinus was accidentally wounded. He expected to find bacteremia, and had blood cultures made from the second day. At first there was no bacteremia, but after eight days there was. It was not until the clot broke down that the bacteria were found in the blood. In closing the eustachian tube he had found it advantageous, after curetting, to so place the skin graft that it laps over the anterior wall of the canal, then to force the graft down into the tube. When the tube was left open, instead of having dermatization of the tympanic cavity, there was proliferation of mucous membrane. Another plan which he had tried last winter was the use of a piece of bone shaped with the rongeur forceps.

At the request of Dr. Richards, Dr. Dench demonstrated the method of skin grafting which he had presented before the American Otological Society at its recent meeting.

Dr. J. A. Stucky, Lexington, emphasized the importance of a careful examination of the ear in every case in which salvarsan is to be administered. In his two cases, to which Dr. Richards referred, complete deafness in the ear previously affected with chronic suppuration followed the use of salvarsan. He had had more trouble with the eustachian tube than with any other part of the radical mastoid operation. He had had unsatisfactory results unless he managed to close the tube. The method he employed was that described by Dr. Dench, plus the use of the Yankauer curette.

Dr. Wendell C. Phillips, New York City, thought a paper like that of Dr. Richards' important, especially as it gave an opportunity for clearing up the records. It emphasized, too, the importance of being careful in making statements, an illustration of which called him to his feet. The members of the society must give Dr. Haskin credit for some very valuable work with reference to the vaccins, and for his radical mastoid work. It was unfortunate, however, that Dr. Haskin should have made the statement, in the contribution to which Dr. Allport referred, that he had not done a radical mastoid operation on a private patient in four years. That statement should have been qualified by mentioning the fact that he had had no cases of chronic middle ear suppuration with symptoms of meningeal or labyrinthine complications. The speaker did not believe Dr. Haskin meant to convey the idea that he would not do a radical mastoid operation in such cases. In the presence of distinct evidence of extensive cholesteatoma, no other treatment than the radical mastoid operation was indicated. These were the dangerous cases. As he looked back over his cases for the last few years, he could not recall a single case of fistula where he did not find cholesteatoma. Such cases could be classed as suitable for no other treatment than radical mastoid operation.

Dr. Richards, in closing the discussion, said if those who thought they would get rid of cholesteatoma, when present, in every case of radical mastoid operation, would study the pathologic anatomy of cholesteatoma of the temporal bone, they would be convinced that in many cases the cholesteatoma had penetrated many cells of the bone which could not be removed without destroying the life of the bone or of the patient.

Brain Abscess of Otitic Origin with the Report of Five Cases.

DR. JOHN W. MURPHY: Five cases of brain infection of otitic origin are presented as illustrating that every case of suppurating ear is a menace to the patient. These cases are interesting (1) from the slight symptoms presented up to within a few hours of the time of operation; (2) in every case it was possible to trace the origin of the infection to a lesion in the middle ear; in three of the operated cases, at the time of operation, and in the two nonoperative fatal cases at a subsequent postmortem. The portion of the brain most likely to be involved from middle ear infection depends upon the manner in which the infection occurs. In the author's experience, when infection occurs by direct continuity, the temporosphenoidal lobe is most often the site of abscess formation. When the extension is through the labyrinth, then the abscess is most often on the anterior aspect of the cerebellum, since the abscess is most often found adjacent to the infected bone area.

In the first case, male, sixty-three years, developed soreness in neck and back of right ear following exposure to severe cold. No discharge from ear, but evidence of old chronic inflammatory middle ear trouble. Temperature 102° F. next day, with considerable pain along tendons of sternocleidomastoid muscle, with some tenderness at the tip. Mastoid operation failed to reveal the seat of the trouble until the entire tip had been explored. In the under surface of the tip there was a perforation about the size of a lead pencil, which opened into a large abscess at the tip. The pus had traveled along the tendons of the sternocleoidomastoid muscle, and had produced a typical Bezold's abscess, containing several ounces of thick, creamy pus. The entire pneumatic process was one mass of necrosed cells and pus. A large opening in the tegmen tympani communicated directly with the dura, through which a quantity of extradural pus escaped when the opening was enlarged and the dura depressed. The bone destruction was quite extensive. The middle ear presented no symptoms of the process, which was explained by the presence of firm granulations in the attic completely shutting off communication with the middle ear. Satisfactory recovery after radical mastoid operation and drainage of the Bezold abscess.

Case 2.—Male, aged fifteen years. Following exposure he complained of pain in the left ear, with beginning discharge the

next day, and cessation of pain. Under treatment with hot boracic acid douches the discharge gradually lessened, and in about ten days ceased. Starting up again, a week later, despite free myringotomy by the family physician, the discharge continued. Symptoms simulated violent frontal sinuitis, yet examination was negative. Following a severe convulsion and unconsciousness, the author was consulted. The patient was profoundly unconscious. The left external canal was full of mucus-like pus.. From the symptoms, the diagnosis was made of localized acute meningitis. Opening and drainage of mastoid advised, but patient died, without having regained consciousness, early next morning. Postmortem examination showed the petrous portion of the left temporal bone much worse than the right, with several areas of roughened bone, showing the point of meningeal infection. The entire petrous portion of the bone was filled with pus and broken down bone cells. The left frontal sinus, the seat of the pain, was found to be normal. The tegmen tympani was also eroded. The left temporal lobe was much discolored, but no abscess was present. A well-defined acute meningitis of this lobe was present, which accounted for the intracranial symptoms, expulsive (?) obstinate constipation, Jacksonian epileptic seizures, and paralysis of the third nerve, all of which characterized the case.

Case 3.—Male, six years of age. Symptoms of mastoid involvement following a discharging ear. Simple mastoid operation, two weeks before the writer saw the patient, was followed by symptoms of cerebral complications. A diagnosis of temporosphenoidal abscess was made, and operation instituted. An enormously enlarged encysted abscess was found in the temporosphenoidal lobe. Complete recovery. Child well one year later.

Case 4.—Male, aged seven years. Operated upon by another surgeon for abscess of the right ear. Wound back of ear did not heal, but continued to discharge foul-smelling pus, varying in degree. Child seemed normal otherwise, and was in school. No cerebral symptoms. External ear dry, drum and hearing apparently normal. Thinking he had simply a sinus to deal with, the essayist opened the mastoid wound, taking his usual precaution, where he did not perform the mastoid operation, of going some distance outside the original incision, to lessen the danger of injuring dura or sinus, if either have been exposed.

He found that neither the antrum nor a single mastoid cell had been opened, but that a button of bone about the size of a silver half-dollar had been removed from the temporal bone. Through this opening there was a tense, bulging, nonpulsating dural protrusion. Exploration revealed an encysted temporosphenoidal abscess, from which was evacuated about four ounces of most offensive pus, in which there seemed to be much gas. The symptoms from which the patient had suffered for months were undoubtedly due to this encysted abscess, which leaked externally when the pressure became too great. This leakage doubtless saved the patient's life. Rapid convalescence followed evacuation of the abscess.

Case 5.—Male, aged thirty-five, was brought into the hospital in a profoundly comatose condition, and no history was obtainable. Pupils contracted, not responsive to light; corneal reflex abolished. Temperature, 99°; pulse, 190; respirations stertorous. Urine negative. Over right mastoid there was an old scar of a former mastoid operation. There was pus in the right external auditory canal. The patient died before he could be operated upon. Immediate examination revealed a large temporosphenoidal abscess. From the amount of cerebral fluid that came away with the pus, the writer was satisfied that the sudden torpor was due to the abscess bursting into the lateral ventricle of that side.

In these five cases, seen within a year, it was possible to demonstrate positively that a suppurating middle ear was the direct cause of the brain infection.

DISCUSSION.

DR. NORVAL H. PIERCE, Chicago, took issue with Dr. Eagleton in the matter of operating through a large opening in both skin and bone in infected areas. He had witnessed bad results from extension to the brain. He had never seen any reason for these large bone flaps in operating upon the brain. He had always attempted, in both cerebral and cerebellar abscesses, to operate through a small incision. He classified brain abscesses as those which occasionally recover, and those which never recover. The abscesses which occasionally recovered were those in which a socalled stalk of the abscess could be followed—in which this fistulous, necrotic pathway of infection could be followed up to the brain cavity. Perhaps the ma-

jority of such cases would recover. In transportation abscesses, where the infected material was transported through the veins or otherwise to the brain from the suppurating focus in the mastoid, where no pathway could be found, and where one blindly stabbed into the brain, failure to recover was the inevitable rule. One either missed the abscess or, even if it were found, there was such an encephalitis or meningitis from going through or infecting the arachnoid spaces, that recovery was impossible. It was difficult to thoroughly explore the wound in the mastoid in those abscesses situated at a distance from the original area of infection. If, therefore, he could not follow the stalk into the abscess, he took away a button of bone. He never laid back a flap. He thought it a very bad practice to explore through an infected area. It was a good plan to endeavor to form a plastic inflammation, before going through with an exploratory instrument, by packing the subdural space.

Dr. Wendell C. Phillips, New York City, congratulated Dr. Murphy upon having the privilege of treating so many cases of brain abscess in so short a time, also upon his large percentage of recoveries. Most of the symptoms, or socalled symptoms, of brain abscess were not symptoms of the abscess itself, but were symptoms which came on later, or after the general meningeal symptoms had appeared. Unfortunately, cases of encysted brain abscess presented very few symptoms until rupture of the abscess walls had taken place. Unilateral headache was the one symptom he had always found to be present. He had become suspicious of a severe and persistent unilateral headache in cases of chronic middle ear suppuration. In many cases it was not severe enough for one to obtain a definite clinical history. He had had a few cases that had impressed him so forcibly that he had come to look upon this type of headache as a symptom of brain abscess. One of these was a young and otherwise healthy student, who weighed one hundred and eighty pounds. He had chronic suppuration of the middle ear, with an excessive discharge. This discharge was so excessive and so foul that the patient wanted some kind of an operation for it. He did the radical mastoid operation without eliciting the symptom of headache. At the time of operation it was found that there was a dehiscence in the attic, and a few drops of pus oozed from a pin-hole opening

in the dura. A large encapsulated abscess was found. On questioning the patient later it was learned that whenever he studied very hard he had severe headache on that side. Another case was one of cholesteatoma with fistula of the horizontal canal. That man complained of incessant headache, but had no other symptom. He was seen by several confrères, including neurologists, but no other symptom could be elicited. Later, operation revealed brain abscess. He asked Dr. Murphy what he understood by "large quantity" of pus.

Dr. John F. Barnhill, Indianapolis, agreed with Dr. Phillips. There were undoubtedly cases in which it was impossible to make a diagnosis of brain abscess, and these were cases in which there had been suppurative otitis media. The unilateral headache was not present all the time, but appeared some time during the twenty-four hours. Headache was a symptom of nearly every class of brain disease, especially of brain tumor; and it was very difficult to differentiate between brain abscess and brain tumor in which otorrhea had ceased. There were also the mixed symptom cases, in which there was considerable localized meninigitis along with the symptoms of brain abscess. He had seen a case very recently in which the pulse was fifty-five, the temperature one hundred and four degrees, and in which the type of headache described by Dr. Phillips was present in all its intensity. There had been projectile vomiting—all the symptoms, in short, usually associated with brain abscess. He counted the father's pulse and found it only fifty-nine. Slow pulse was probably a family characteristic in this case. He agreed with Dr. Eagleton in the matter of turning down a large bone flap in order to make a more accurate diagnosis and more thorough evacuation.

Dr. Frank R. Spencer, Boulder, said nystagmus, in cases of temporosphenoidal abscess, might be absent. As in one of Dr. Murphy's cases, it might come before projectile vomiting, and it might change suddenly. It might occur with the quick component to the right, and then change suddenly to the left. This had been emphasized by Ruttin and Neumann. He recalled a case which he and Dr. Murphy had seen, four years ago, in Ruttin's clinic. The patient, a young woman, had nystagmus which changed character twice while the patient was under observation in the clinic. The suddenness with which the quick component changed from side to side was very characteristic of cerebellar abscess.

DR. J. A. STUCKY, Lexington, said the method of drainage which he had found most satisfactory was that of Sir Victor Horsley, by means of several strips of rubber tubing. Through this rubber tubing the abscess cavity could be irrigated. The use of gauze was conducive not only to the formation of granulations, but to the opening up of areas of infection. The tubing could be removed one piece at the time.

DR. S. MACCUEN SMITH, Philadelphia, congratulated Dr. Murphy upon the facility with which he diagnosed and located the abscess formations. In fifty per cent of his own cases the abscesses were found postmortem. Brain localization was one of the most difficult and very often the most unsatisfactory subjects with which to deal, notwithstanding the recent advances in this line. He corroborated what Dr. Pierce had said with regard to making a large opening.

DR. ARTHUR B. DUEL, New York City, said his experience accorded with that of Dr. Pierce with regard to the classification of brain abscesses. Those cases in which he had found a "stalk" leading to the abscess cavity had invariably recovered. Where he had found a stalk of entrance he had done very little except to open up the bone freely to give vent through the naturally made pipe. Perhaps nine out of ten cases of brain abscess reported as cured had been of this type. The unsuccessful cases had been those in which he had been unable to find a "stalk" of entrance. In a number of instances he had located and drained the abscess, but the patient had died from meningitis or encephalitis by extension of the infection. This type of brain abscess would be more successfully treated when otologists learned to employ the technic suggested by Dr. Eagleton, of turning down a large flap and observing the niceties of surgical technic. He emphasized the importance of avoiding puncturing the vessels, as the hemorrhage which would thus take place into normal brain tissue would cause encephalitis or meningitis.

DR. GEORGE W. MACKENZIE, Philadelphia, gathered that in many of the reported cases the abscess appeared to develop within a week or ten days after the mastoid operation. In view of the four stages through which an abscess had to pass in its development, he thought this too short a time. Referring to the use of a small knife, such as Dr. Murphy had suggested, he said one might strike the abscess and yet not get pus.

He advocated a crucial incision in order to find the pus. It was enough, when the pus began to come faster and faster, to put on the artery clips and dilate the opening. He had known of cases successfully operated in which the patient lived three or four weeks and then died. It was not easy to put in the rubber tube and keep it in place, nor was it always easy to drain these cases as they should be drained. It had been suggested that a brain abscess should be treated as an abscess in any other part of the body; to do this it would be necessary to make a large opening and curette the abscess cavity very gently. This would shorten the duration of an abscess. It was not always easy to locate an abscess. He cited a case in which he had recently been mistaken with reference to a temporosphenoidal abscess. The case in question was one that developed in the coures of a labyrinth suppuration. Besides the general symptoms common to all brain abscess cases, the focalizing symptoms seemed to point to the cerebellum. Upon incising the cerebellum rather freely no pus could be found. It was then decided to open the temporosphenoidal lobe, when a large abscess was found and drained. An interesting finding in the case was the presence of a horizontal, wide excursioned nystagmus to the side operated that was not present before the operation. In fact, prior to the operation the patient had a short excursioned rotary nystagmus to the same side. This horizontal nystagmus following the operation must have resulted from the incision made in the cerebellum, and corroborates the claim of Alexander and the speaker that irritation in the cerebellum produces horizontal wide excursion nystagmus to the same side, in contradistinction to the rotary short excursion nystagmus found in labyrinthine affections.

Dr. E. B. Dench, New York City, thought a bone flap absolutely contraindicated. A brain abscess must be explored through the stalk; failure to find anything could then be followed by making a flap. An ordinary curved director was better than a knife. He had devised a director in quarter inches, which could be carefully introduced until a free flow of pus was obtained. He then inserted a cigarette drain of gauze, which could be left in place for twenty-four or forty-eight hours, and which would give all the drainage needed. This could be replaced, as the abscess cavity collapsed, with folded rubber tissue.

DR. SMITH added that drainage of a brain abscess should be through the avenue of infection. All his cases which had recovered had been drained in that way, whereas cases which he had evacuated through decompression had uniformly died.

DR. MURPHY, in closing the discussion, said he had seen two infections of the middle ear with temporosphenoidal abscess. He had brought up this subject in order to emphasize the belief that running ears were more often the cause of brain abscess than had been thought.

A Report of a Collective Investigation on the Curettement of the Eustachian Tube in Chronic Aural Suppuration.

DR. SIDNEY YANKAUER published in *The Laryngoscope* of July, 1910, a procedure for the cure of chronic otorrhea. In order to ascertain what the experience of other otologists had been with this operation, he wrote to over six thousand otologists in the United States and elsewhere. Among nearly two thousand replies, he found one hundred and nineteen operators who had performed the operation from one to fifty-three times, the total number of cases operated upon being seven hundred and thirty-five.

Inasmuch as the operation is based upon the principle that the closure of the eustachian tube is essential to the healing of the diseased ear, it naturally follows that in those cases in which organic atresia did not result from the operation, a cure could not be expected, and the statement that the closure of the tube will be followed by a cure can be true only of those cases in which the tube has actually been closed. Both sets of figures are given. Of the seven hundred and thirty-five cases, the tube was successfully closed, after one or more curettings, in six hundred and nine, or eighty-three per cent of the cases. The number of patients reported as cured is three hundred and seventy-nine, or 51.5 per cent of the total number, or sixty-two per cent of the number in which the tube was successfully closed. In other words, more than one-half of all cases of chronic suppuration of the middle ear have been cured by closing the eustachian tube through the intact external auditory meatus and without other surgical treatment.

In the author's experience, confirmed by observations extending over ten years, it might be stated as a dictum that

whenever the eustachian tube is permanently closed by organic atresia, a perforation in the drum membrane will never close and cannot be made to close. Whenever, therefore, in any case it seems to be possible to restore the continuity of the drum membrane, after the suppuration has subsided, and so restore the ear to a perfectly normal condition, the eustachian tube must not be closed. In such cases the operation is contraindicated, as it is also in those cases in which it is intended to perform one of the socalled conservative radical operations, which are also supposed to result in the closure of the drum membrane. Furthermore, the procedure is adapted only for the cure of a chronic suppurative process, and should never be employed in the presence of an acute exacerbation. In like manner, the presence of intracranial complications demands the immediate exposure of the entire diseased area, and to delay such exposure until the results of tubal atresia can be known would be entirely unjustifiable; besides which, in the presence of intracranial complications, even if these have become latent, any operative procedure upon the ear, short of a radical exposure of the entire diseased area, might be dangerous, as is suggested by the single death which has followed this operation. The history of this case is detailed.

Inasmuch as the eustachian tube, in the class of cases under consideration, has permanently lost its function, its closure is harmless; and, inasmuch as it assumes a perverted or pathologic function, its patency is detrimental and its closure has become a therapeutic necessity.

Only two hundred and sixty-six cases, or thirty-six per cent, were closed after the first curetting in this series, while two or more curettings were needed in two hundred and forty-four cases. Hemorrhage, sufficiently profuse to be designated as severe, was reported in only twenty-six, or 3.6 per cent of the cases. The hearing was reported upon in five hundred and sixty-four cases. It was improved in two hundred and fifty-eight, or forty-six per cent of the cases; unimproved in two hundred and eighty-one, or fifty per cent of the cases; and in twenty-five cases, or four per cent, it was made worse. Hence the hearing was improved in ninety per cent of the cured cases. Tinnitus was reported in three hundred and sixty-five cases, in which it was lessened in one hundred and eighty-nine, unchanged in one hundred and fifty-nine, and made worse in seventeen cases.

His procedure may be carried out under local anesthesia and in dispensary practice.

This collective investigation justifies the following position: Whatever method is adopted to secure the healing of the diseased middle ear cavities, whether nature be allowed to effect the healing unaided, whether the efforts of nature be stimulated by the administration of vaccins, whether nature's work be made easier by the removal of some of the diseased parts by minor surgery, or whether her work be made easiest of all by radically removing all diseased tissue, in any event, in every case reinfection of the diseased area must be prevented by closing the avenue of infection, the eustachian tube.

The following conclusions may be based upon these figures:

1. That closure of the eustachian tube is harmless because it does not cause the loss of any function which has not already been permanently destroyed.

2. That it is a valuable therapeutic agent because by it alone half of the cases are cured and the rest so improved that it enables the radical operation to cure the other half.

3. That it is imperative, not only because the tube has assumed a perverted or pathologic function, but because the only other resource which is open to the patient is a radical operation, in which case the tube must be closed anyway.

4. That every patient should be given the benefit of this procedure, not only because the chances of cure are sufficiently high, but also because if cured thereby the hearing will not only be preserved, but improved.

5. That the figures here presented also justify the statement that on account of the difference in the effect upon the hearing, the radical operation should be regarded as unjustifiable in any case where there is useful hearing left, until a thorough trial has been given to the closure of the tube alone through the intact auditory passages.

DISCUSSION.

Dr. Francis P. Emerson, Boston, congratulated Dr. Yankauer on having devised an effective instrument for clearing out the eustachian tube. He was in accord with Dr. Yankauer's views concerning the pathology of the eustachian tube, and with reference to the importance of stopping the reinfec-

tion of the tube. His experience, however, and the statistics which he had gathered from other operators at the Massachusetts Eye and Ear Infirmary, did not conform to the essayist's ideas concerning the permanency of the closure of the tube. In the condition to be dealt with there was a funnel-shaped cavity which was already infected, in which the lining membrane might be absent, and in which necrosis of the bony element might be present. The endothelial elements were of lowered vitality. Healing must take place either through granulation or through cicatrization. If there was healing through granulation there would first be inflammation and reaction. During this stage the tube was closed down. But if statistics were to be of value as to the permanency of the healing of such a tube, they must be taken two or three years after the operation. In order to try out this method he and Dr. Mosher had turned over all their cases to one of the assistant surgeons, Dr. Lougie, and his results were embodied in a paper read before this society in Atlantic City last year. Out of twenty-five cases examined it was found that the tubes were open, with discharge and granulations, in eleven cases; tubes closed, with ear discharging, in one case; tubes open, with ears dry, in eight cases; tubes closed, with ear dry, in one case. There were four cases in which cholesteatomata were present. These should not be included. During the last month, in order to follow the matter a step further, the speaker went over the records of the Massachusetts Eye and Ear Infirmary, and of the cases which had been operated upon by different operators and in which no skin grafting had been done, only twelve reported for examination. Of these twelve cases only one tube was closed. This was a case in which Dr. Mosher had introduced into the lumen a piece of cartilage. Over this piece of cartilage there was a thin layer of epithelium.

Dr. John F. Fairbairn, Buffalo, had tried the method in four selected cases, shortly after the publication of Dr. Yankauer's paper, and after Dr. Yankauer had demonstrated the method to him. He said selected cases advisedly, because he did not believe the procedure would be effective in the presence of a pathologic condition in the attic, antrum, or of the ossicles, but absolutely indicated in tubal suppuration. In three cases he succeeded in getting dry ears; in the fourth he

got no result. The only difficulty encountered was the intense reaction which followed the operation. This reaction extended up over the promontory. He had since used Urbantschitsch's modification of the Yankauer instrument and method. This instrument was a rasp-like celluloid bougie. A small sized catheter was first passed through the extended canal to the aural opening of the tube, and through this the bougie was passed and the walls of the tube denuded. He had used this method successfully in five cases.

DR. YANKAUER, in closing the discussion, said he had been unsuccessful in obtaining a reply from Dr. Lougie to the circular letter which he had sent out. He was therefore glad that Dr. Emerson had referred to them. It is not correct to judge the operation by comparing cases in which the operation had been successfully performed with those in which it had been performed unsuccessfully. It had been shown by this investigation that in cases in which the tube was not closed after curettement, a larger percentage were improved in regard to the suppuration. It was likely that if none of these cases of Lougie's had been curetted, not so many would have been cured. If all of them had been successfully curetted and the tube closed, many more would have been cured.

Referring to Dr. Beck's remarks, he stated that it was necessary to remove the mucous membrane from the isthmus; because at this point there was an osteochondral synarthrosis; and at such a place, where cartilage meets bone, any irritation will cause thickening of bone, and hence here a bony atresia might be produced. That temporary closure of the tube could be produced by swelling of the mucous membrane seemed quite possible, and in such cases the tube would reopen.

The instrument of Urbantschitsch, to which Dr. Fairbairn referred, was a roughened celluloid bougie, and was introduced into the tube through the eustachian catheter, and was not intended to destroy the mucous membrane, but merely to set up an irritative inflammation.

The End Results of the Radical Mastoid Operation.

DR. S. MACCUEN SMITH gave a short review of the evolution of the mastoid operation from Riolanus in 1649 to Stacke in 1891. In his practice he had considered the indications for the mastoid operation valid only in those cases

that had utterly failed to respond to persistent nonoperative treatment, but he believes that the end results are probably much better, especially in point of hearing, when the operation is performed reasonably early.

In a large percentage of these chronic cases the middle fossa is found to be unusually low, the sinus in some instances being so far forward as to occupy the greater part of the antrum; hence, the advantage of an X-ray photograph to determine these points, more particularly the position of the sinus.

Dr. Smith sent letters to three hundred and thirty-four patients, requiring them to come for an examination as to the end results of the radical mastoid operation. Two-thirds responded. Suppuration had completely subsided in a large percentage of cases, and in those in which it still continued, its source was the tympanic cavity, being usually due to the eustachian tube becoming patulous. An examination of some of the cases which showed no discharge showed complete dermatization, an improvement in the hearing, entire absence of all head symptoms, and not the slightest accumulation of desquamated epithelium. The time of examination varied from two to fourteen years after operation, and the duration of the otorrhea before operation ranged from about one year to forty-seven years. The time for after-treatment for out-patients in the hospital service averaged three months. This period was considerably reduced for the private patients. The author had never seen an intracranial complication develop after a radical operation. The patients, almost without exception, improved in general health. Dr. Smith found frequent intracranial or labyrinthine involvement at the time of operation, unsuspected before, which almost invariably complicated the recurrent type of chronic discharge.

The cases ranged from one year to over fifty years in age, the largest percentage being between twenty and thirty. If the functional activity of the internal ear remained the same as before operation, the hearing of the average case should be as good after this surgical procedure as before. In thirty-two per cent of the operated cases the hearing is definitely better. In forty-nine per cent it remained relatively the same; of the remaining nineteen per cent, in eleven per cent the hearing decreased after operation, according to actual records, while in eight per cent it decreased according to the statement of the

patient. The author, therefore, believed that the operation is not likely to result in an impairment of hearing.

Bell's palsy developed in three cases of the author's series before operation, and eight subsequent thereto. Two improved slightly and four entirely recovered, and two approximately so.

The radical operation should be regarded as a major procedure. Nevertheless, it is usually productive of a maximum amount of good and is therefore wholly justified. If chronic otorrhea has its origin in the mastoid antrum or lower cells, it can be relieved, as a rule, only by mastoid operation.

DISCUSSION.

DR. ARTHUR B. DUEL, New York City, emphasized the fact that in chronic otorrhea requiring radical operation two distinct types of cases, offering two distinct problems, were encountered. In the first class of cases the life of the patient was in danger because of the surgical condition present; in the second type there was an annoying discharge which repeated efforts had failed to cure. The end results in these two types of cases were naturally different. The statistics which had been formulated as to the length of time of healing had been confused with regard to these two types. Those who claimed that their radical cases healed in from five to six weeks, had operated in a class of cases in which the surgical condition consisted in a mass of granulations, without necrosis in the bone, and an annoying discharge. The cases which necessitated radical operation for the other condition required, in his experience, a longer time for healing—usually from eight to ten weeks, and, in many cases, six months to a year. He would never consider a case in which cholesteatoma was present as healed until at least two years had elapsed without recurrence. The patient, in an uncomplicated case, could be considered out of danger as soon as the operation had been performed. In the cholesteatoma cases the patient was in some danger, though infinitely less after operation, until recovery was complete. For a long time he endeavored to skin graft all his cases, but in his experience had found it better to do the skin grafting in the third week after the operation—that is, after the cavity had been covered over with granulations. He thought it much safer surgery to leave out the primary skin graft in all cases. In cases in which exposed dura

over the middle fossa or sinus was perfectly healthy, it might be considered safe to cover immediately with a skin graft; but who could be certain in a suppurating wound, that he was not bottling up virulent organisms? In many cases it was necessary to expose large portions of dura which were covered with a mass of suppurating granulations. One could hardly doubt in such cases that there was great danger in covering this immediately with skin graft, lest the organisms present set up an active inflammation either in the exposed dura over the middle fossa or sinus. Even allowing that antiseptics strong enough to sterilize these areas were used, they would at the same time render the granulations unfit for receiving skin grafts.

Dr. E. B. Dench, New York City, referring to the effect of chronic purulent otitis media upon the general health, cited two cases in which there had been marked improvement in the general health following the radical mastoid operation. One patient had gained nine pounds in two weeks. This chronic aural suppuration produced a low grade toxemia, and it was often difficult to determine just what was the matter with the patient thus affected. The patient who gained nine pounds was supposed by the family physician to have malaria. As to the effects of the radical operation on the hearing, he was glad to see that Dr. Smith's statistics tallied with those which the speaker had presented at the Otological Congress at Bordeaux. If hearing was very poor, and there was no labyrinthine complications, hearing would be improved after radical operation. If hearing was only moderately impaired, with no labyrinthine involvement, it would remain the same. If hearing was very good, the patient should be told that the operation would probably make the hearing worse. He had not been able to decide upon the two types of cases mentioned by Dr. Duel. He thought every case with chronic middle ear suppuration in danger. It could not be said that one case was in danger and another not. Until one had cleared out the middle ear and tympanic cavity and mastoid, and could see the sinus and middle cranial fossa, one could not say there was no danger. The primary skin graft had been successful in his hands. He had never seen a case in which the skin graft caused trouble unless the sinus or the dura were very badly diseased. He had grafted over these areas repeatedly without trouble. Second-

ary grafting had not been so successful in his hands. He saw no reason for subjecting a patient to two anesthesias. Two weeks was the shortest time in which he had had dermatization. This was almost the invariable rule in both private and hospital cases, the tympanic cavity, roof of the tympanum, and entire mastoid cavity being absolutely dermatized and dry in ten days or two weeks. He had seen many patients two years after operation and had found the cavity perfectly dry.

Dr. George F. Keiper, Lafayette, referred to the fact that life insurance companies refuse to accept persons with chronic otitis media, and for that reason he always advised such patients to submit to radical mastoid operation. He thought this advisable, not only for the preservation of life, but in order to enable the individual to occupy a more satisfactory position in life.

Dr. John W. Murphy, Cincinnati, knew of no class of cases that placed more responsibility upon the doctor than cases of chronic otitis media, not only with regard to life but also as to hearing. He recalled a case in point, that of a young woman, thirty years of age, who had a deaf mother and sister, and who, in childhood, had had double otitis media. The left ear had ceased to discharge, but had no membrane except scar tissue. She had applied for treatment for a rather offensive discharge from the right ear. She had no hearing in the left ear and a chronic condition in the right, with gradually decreasing hearing. He could not promise that the end results would be better after operation. She consented to the radical mastoid operation. At the end of two weeks the discharge in that ear stopped, but at the end of two days she developed left sided paralysis. If that had developed on the right side, he would have thought the operation had something to do with it. It was a strange coincidence that a patient should have Bell's palsy on the side of the ear not operated upon, two weeks after the operation.

Dr. James E. Logan, Kansas City, spoke of cases in which, after thorough operation, with the cleaning out of all necrotic tissue, there were still recurrent attacks. In many such cases he had been able to give permanent relief by cleaning out the vault of the pharynx, which may have been the seat of infection, from time to time. He believed in many cases of chronic suppurative otitis the vault of the pharynx was the cause of the trouble.

Dr. Frank Allport, Chicago, had been in the habit of estimating his cases, with reference to hearing, in accordance with Dr. Dench's formula. In the large majority of cases the radical mastoid operation gave good results so far as hearing was concerned. For the last five years he had used gauze only for the first few days, substituting the gauze packing in a week's time with boracic acid powder, filling the cavity almost completely with the boracic acid powder and covering this over with a little gauze. Healing took place more quickly under this form of packing than with anything else. He agreed with Dr. Logan with regard to the part played by the pharynx in the clearing up of these cases. The end results would be better if all paid better attention to the pharynx, particularly to the clearing out of the fossa of Rosenmüller. He did not employ skin grafting in all his cases. Whether one resorted to grafting or not, Dr. Dench's results with this method were notable. He had formerly employed the Ballance method, and also Dr. Hammond's method, but latterly, when he used a graft at all, he followed Dr. Dench's plan.

Dr. George F. Cott, Buffalo, said one sometimes had the opportunity of making postmortem examinations of cases in which the radical mastoid operation had been performed. He had had one hundred and eighty radical mastoid operations. One patient had had a discharge for forty years, and she was forty-four years old. He did a radical operation, when he found a hole in the dura one-eighth of an inch in diameter, through which the probe passed one and one-quarter inches. He dropped the probe down easily, slit this open, and did nothing more. The patient did well. At the end of two years she got sick suddenly, and died in two days. Postmortem examination revealed basilar meningitis, with meningococcus infection. In another case there was acute middle ear suppuration, with intense pain for a week. He operated; the patient did well for two days, then the temperature, apparently normal, went up to 104.5 degrees, then down to somewhat below normal. The patient died. The subarachnoid spaces were found, upon postmortem examination, to be entirely filled with blood, in different stages of clotting. In the third case a girl had acute otitis media of six weeks' duration. At operation the entire mastoid bone was found to be sclerosed. She had had pain in her eyes since she was very young. She appar-

ently recovered from the operation. He saw her at intervals for six months. She died suddenly, having considerable pain at the base of the brain. Postmortem examination revealed a cerebellar abscess as large as the little finger. She had not had a symptom other than the pain. Two abscesses were found on the parietal lobe of each side.

Dr. Thomas J. Harris, New York City, said it had seemed to the program committee that Dr. Smith's paper was exceedingly timely. Judging from the discussion, it would seem that the paper had given the impression that there was nothing but the favorable to be said concerning the mastoid operation. It was his own observation, in this country and abroad, that this was not the case, that such were not the results that were being obtained. It was for this reason that Dr. Smith had been invited to discuss this subject. One had only to go into a clinic in any large city to see patients treated week after week for chronic suppuration, to see case after case of facial paralysis going in for dressings. Was it fair to consider this operation from the results of brilliant operators, or should it not be considered from the point of view of the majority of operators? As Dr. Cott had said, there were cases of death. Was death, in these cases, due to the mastoid, or was it coincidental? The mastoid operation was not performed entirely for chronic suppuration; it was performed frequently as the next step in an intracranial operation. He wished that there might at some time be a referat, as had been done in Dr. Yankauer's paper, so that the results of those having a small number of cases might be obtained. There was a feeling that the radical mastoid operation was being overdone, that it was done too quickly. Was that the case? After reviewing the statistics, could it be said that the results for the last fifteen years have been good?

Dr. Smith, in closing the discussion, said when skin grafting was first introduced he had used it with not very satisfactory results. He discontinued the method for a number of years, and then, stimulated by Dr. Dench's results, he had taken it up again, but could make no report on the cases so treated because they were too recent. He employed Dr. Dench's method, using one large graft and two smaller ones, all primary grafts. He had had few cases of Bell's palsy, three of which occurred previous to operation. In two cases

he was called out of town on the day appointed for the radical mastoid operation, and that night Bell's palsy developed. If he had operated at the appointed time the palsy naturally would have been attributed to the surgical procedure. Deaths following the radical mastoid operation were, in his opinion, due to complications. He had never seen a death occur in an uncomplicated case.

Vertigo of Labyrinthine Origin Following a Chronic Suppurative Otitis Media With Cholesteatoma. First—Simple Mastoid With Curettage of the Middle Ear and Eustachian Tube. Second—Radical Labyrinth Exenteration.

Dr. Francis P. Emerson: The otologist is particularly interested in those labyrinth cases which, in their final analysis, confirmed by operation, may be readily labeled pathologically, and yet in their clinical manifestations may have presented a reasonable doubt as to the surgeon's attitude in regard to immediate operative interference. The relation of the vestibular apparatus to the brain demands exact diagnosis and immediate surgical intervention in all pyogenic invasions of the labyrinth, if life is to be saved. The case outlined is offered as one with delayed symptoms, and one which was perhaps less clear clinically than many.

The patient, male, aged sixty-two years, was admitted to the Massachusetts Charitable Eye and Ear Infirmary, August 11, 1913, with a diagnosis of otitis media suppurativa chronica of the right ear. The case is summarized as follows: The patient is a man prematurely old. There is a perforation of the septum. His wife has had two miscarriages. The hearing test for his good ear—that is, the left—the writer has found to be strongly suggestive in other cases of lues—i. e., a low note, but little, if any, raised, a positive Rinné, with marked lowering of bone conduction, and the whispered voice reduced to 1/25 or 1/35. In this case there was a negative Wassermann, but no examination was made of the cerebrospinal fluid. His eyes and a physical examination did not give evidence of specific disease. Could lues then be eliminated as a direct or contributory factor in this patient's symptoms?

The right ear gave a history of discharge for thirty years, and in addition there was a cholesteatoma, which, as is well known, is quite apt to invade the labyrinth. There were granulations in the posterior quadrant. The hearing test done sev-

eral times always showed vestibular irritation when the vertical canals were in the plane of rotation. Unfortunately the difference in the after-nystagmus between the turning to the right or to the left was not recorded. The fistula and caloric tests were negative, and there was no nystagmus. The hearing test, done by two different observers, showed total deafness for the right ear, except a bone conduction of three inches. Can we say that this then was a case of diffuse purulent latent labyrinthitis, and that the apparent vestibular reaction was compensatory? According to Ruttin, this does not occur unless a latent purulent labyrinthitis has existed for a long time, and has been followed by a complete ossification of the labyrinth or sequestration. In this case there was no clinical history of vertigo until five weeks before admission, and our operative findings showed the horizontal canal free, while the superior and posterior contained a grayish red, granular, nonadherent detritus. There was no organized tissue or evidence of ossification present. The second day after operation we have a clear, serous discharge resembling cerebrospinal fluid. There was no facial paralysis, and no sequestrum was found. On the other hand, the turning test was always positive.

Have we any evidence to suggest that this was a case of diffuse serous secondary labyrinthitis? The onset of the vertigo favors this supposition, and is confirmed by the hearing test, which shows a remnant of vestibular irritation present. The operative findings are also consistent with this diagnosis; on the other hand, the caloric and fistula tests were negative, and there was no nystagmus at the time the patient was examined. The caloric reaction we know may be lost. If we assume that the portal of entry was originally by way of the oval window, could we not explain the failure at this time to obtain a positive fistular test by the presence of granulations in the posterior quadrant of the middle ear? We recognize that such an invasion is more often followed by a purulent labyrinthitis; but three cases of fifty reported by Ruttin were followed by the serous form. There remains then to be accounted for the absence of nystagmus. This is a symptom of irritation, and if of the second degree, it might readily have been wanting at the time of observation. In the light of our symptomatology and the operative findings, the writer is inclined to consider the case one of a diffuse serous secondary

labyrinthitis, as affording the only consistent diagnosis. For those who accept this interpretation, the division into two stages of the operative procedure is perfectly consistent. If this diagnosis is accepted, we must assume that there were no well defined symptoms immediately following the mastoid operation, but that if present at all, they were but little marked, and only developed as a pronounced diffuse serous secondary labyrinthitis on the sixth or seventh day.

DISCUSSION.

DR. E. B. DENCH, New York City, thought it a mistake to follow the foreign school in making a classification of these cases into serous, suppurative, or perilabyrinthitis. Neumann, Ruttin, and others had said if a diagnosis was made of one or another kind, one must do one or another kind of operation. He thought Dr. Emerson's plan of treatment in the case under consideration the proper one. He had had cases in which, if he had followed the foreign school, he would have killed his patient. The results of the German operators did not show that their operative recommendations were always warranted.

DR. NORVAL H. PIERCE, Chicago, corroborated what Dr. Dench had said with referenec to the foreign school and their methods. He cited a case, which had been under his observation at the Illinois Eye and Ear Infirmary, of acute otitis media, with obvious mastoid and labyrinthine involvement. The woman had had repeated attacks of discharge from the ear, extending over a number of years, each time running an apparently normal course, until the last, when swelling and pain appeared over the mastoid. She complained of great dizziness. The caloric reaction was negative, as to both heat and cold. There was nystagmus to the opposite side. She was absolutely deaf in the diseased ear, as proved by Neumann's apparatus. There was no fistula. Here was a case for immediately going into the labyrinth, according to the German school. He had so completely abandoned their ideas that he had probably swung to the opposite extreme. He did not open this woman's labyrinth, and she recovered. This was one of six or more similar cases which had come under his observation during the past year. He did a simple mastoid operation. It was impossible to differentiate between suppurative destructive labyrinthitis and serous labyrinthitis which

was capable of recovery. The cases which he had observed for some length of time had recovered function so far as hearing was concerned. He believed one should never do a labyrinth operation when symptoms of meningitis were present; to operate under such circumstances would have very little effect.

DR. EMERSON, in closing the discussion, said his object in presenting this case was to bring out just such remarks as those of Dr. Dench and Dr. Pierce. These cases should have a preliminary mastoid operation, and the labyrinthine operation only in the presence of evident signs.

The Labyrinth Operation—The Frequency With Which It Is Demanded as Determined by Hospital and Private Statistics Extending Over a Period of Ten Years.

DR. EDWARD BRADFORD DENCH stated that it was the object of his paper to show by statistics the relative infrequency with which labyrinth suppuration occurs as a sequel either of acute or chronic middle ear involvement. Between 1904 and 1915 less than one-tenth of one per cent of the cases of middle ear involvement at the New York Eye and Ear Infirmary were subjected to the labyrinth operation.

Dr. Dench's own records, from May, 1905, to May, 1915, show six hundred and fifty-nine cases of acute mastoiditis and secondary mastoiditis operated upon, five hundred and thirty-three cases of chronic middle ear suppuration subjected to the radical operation, twenty-three cases of brain abscess, thirty-three cases of meningitis, and thirty-seven cases of sinus thrombosis. From 1907 to January 25, 1915, the same records show twenty-two cases in which the labyrinth operation was performed. These records would show that a labyrinthitis, demanding operation, is a most infrequent complication of a middle ear lesion. Labyrinthitis occurred in only two per cent of the operated cases of middle ear suppuration.

Dr. Dench called a removal of a portion of the labyrinth a "partial" operation, and the free opening of the horizontal semicircular canal, the vestibule and the cochlea, thus securing complete drainage of the entire labyrinth, the "complete" operation. He performed the partial operation in ten cases and the complete operation in twelve cases. Of the cases in which the partial operation was performed, seven were cured and three died; of the complete operation, seven were cured

and five died. Of the three fatal cases of partial operation, one died of malignant disease and two of meningitis. Of the five fatal complete operation cases, four died of meningitis and one of a pulmonary thrombus secondary to a jugular thrombosis. In two of the remaining fatal cases the operation was performed for the relief of an existing meningitis.

Dr. Dench concluded that the necessity of the complete labyrinthine operation is comparatively infrequent, and that the operation should only be undertaken in the presence of very definite symptoms, pointing to either acute labyrinthine involvement or an acute exacerbation of a previous labyrinthine suppuration. When these symptoms occur, operative interference is imperative, and must be prompt if it is to be successful. The expectant plan of treatment will probably be followed by the best results in cases of circumscribed labyrinthitis, or of a purulent labyrinthitis which is quiescent.

DISCUSSION.

Dr. George W. Mackenzie, Philadelphia, disagreed with Dr. Dench regarding the treatment of cases of circumscribed labyrinthitis in the semicircular canal by curetting and nothing more. Of course it was desirable to preserve the hearing as much as possible, but by curetting in the neighborhood of a fistula one would be apt to spread the labyrinthitis. He had done this is one case, with loss of function in the horizontal position, but with retention of function in the vertical canals. In cases of labyrinthine suppuration, with positive evidence that the labyrinth was dead, the labyrinth operation should be done at the same time that the mastoid operation was performed, otherwise the case was apt to terminate fatally. He had reported fifty-five cases, not his own, in which there were two fatalities. One was a case of Neumann's, and one Alexander's. Both these fatalities were due to the fact that the radical mastoid was done and the labyrinth left untouched, when the labyrinth should have been operated radically. There was some doubt in the minds of these surgeons as to the diagnosis of labyrinth suppuration before the operation on the mastoid. These two errors were committed early in the experience of these men, at a time when the knowledge of the labyrinth was more limited than it is now. His present conviction concerning the subject of labyrinth suppuration is that we

should not attempt any operation on the mastoid without at the same time draining thoroughly the labyrinth. Furthermore, that no operation on the mastoid or labyrinth should be attempted until a most careful examination of the labyrinth by all known tests had been made and a positive opinion arrived at concerning the condition of the labyrinth. Circumscribed irritative conditions of the labyrinth (congestion) without the fistula sign did well with mastoid operation alone. Circumscribed destructive conditions would always tax the skill of the surgeon as to what was best to be done. Each case would need separate consideration, as there was no fixed law by which one should be governed in all cases.

Dr. Arthur B. Duel, New York City, thought it interesting to note the change of attitude with reference to these cases of suppurative labyrinthitis. When the Vienna school first promulgated their ideas, their plan was pretty generally adopted. No doubt many mistakes were made as a consequence. The general opinion among surgeons of the present time was to regard acute cases, whether suppurative or not, as unfavorable for operative intervention. These cases should never be operated in the acute stage unless there were evidences of a concomitant meningitis. It was much better to wait: for, if operated upon immediately, they were much more apt to die, by precipitation of the very complication they were trying to avoid, rather than to recover. He had shared with Dr. Pierce the rather hopeless view of meningitis until last year, when he succeeded in curing a case by means of the Neumann operation and drainage at the internal auditory meatus, accompanied by repeated spinal punctures, drawing off twenty to thirty cubic centimeters of milky cerebrospinal fluid, at the same time injecting back about forty grains of urotropin in fifteen or twenty cubic centimeters normal salt solution. At each subsequent tapping of the cord, done at intervals of one or two days, six times, the fluid became more and more clear, until the patient finally recovered. He shared the belief of the majority, that in chronic cases if at the time of operation the gross appearances indicated the presence of a fistulous opening and necrosis, it might be necessary to open the labyrinth; otherwise it was better to wait for further symptoms.

Dr. Mackenzie added that many cases of supposed labyrinthine suppuration of ten years' standing might present all

the symptoms of labyrinthine suppuration, and yet there might never have been this condition, but, instead, a chronic labyrinthitis of the plastic type. Unless, therefore, Dr. Beck, or someone else, had seen the case at the very onset, with complete loss of function, it could not be pronounced a case of labyrinthine suppuration. There must be typical signs of suppurative labyrinthitis. There was, with suppurative labyrinthitis, sudden, complete loss of hearing, loss of equilibrium, with negative findings by caloric tests, by galvanism, and by turning. Answering a question by Dr. Pierce concerning the method of differentiating between serous and suppurative labyrinthitis, the speaker said it was indeed difficult to make the differentiation early. Headache and fundus findings were guides. When present they suggested a suppurative type of labyrinthitis.

Dr. George L. Richards, Fall River, asked whether the discussion concerned the perilymph or endolymph channels, whether within or without the membranous labyrinth. It made a great difference.

Dr. Norval H. Pierce, Chicago, said the functional symptoms of serous and suppurative labyrinthitis were the same, and one condition could not be differentiated from the other. The only light thrown on the subject was that given by the meningeal complications. It was better not to operate until the meninges were involved.

Dr. Dench, in closing the discussion, said, in answer to Dr. Richards' question, the subject involved both the perilymph and the endolymph, and was within the bony capsule. It could not involve the endolymph without involving the perilymph. That was just the hair-splitting question the German school had raised. He could not agree with Dr. Mackenzie with reference to the treatment of circumscribed labyrinthitis. He believed it wise, in the presence of a fistulous tract, to go in with the curette, where this could be done without breaking down nature's barriers to the course of infection. He removed all necrosis with a small curette.

Report of an Unsuccessful Labyrinthectomy for Relief of Distressing Tinnitus Aurium.

Dr. Arthur B. Duel: Tinnitus aurium of such distressing character as to produce insanity, or to drive the sufferer

to suicide, is, fortunately, a rare occurrence. The occasional case, in which every effort has failed, and where sedatives have become useless, except for the immediate time being, present as sad a spectacle as the most hopeless alien. The few cases that have been reported in which major operations, like division of the auditory nerve or destruction of the labyrinth, have been tried for their relief, have met with so little success that no one would be tempted to undertake another, except under great stress of circumstance, or some peculiarly hopeful prospect, as in the case recorded.

The patient, a woman, sixty years of age, married, had slight deafness following typhoid fever at the age of eighteen years. At the age of thirty-five she first noticed noises in the head, described as escaping steam. Hearing became gradually impaired, and the noise persisted. She was variously treated by different specialists, without relief. She finally came under the observation of Dr. Fielding O. Lewis, of Philadelphia, in 1912. At that time she could hear slightly a watch in close contact with the left ear, and a whisper at about six inches. Local measures failed to improve the condition. She now complained of a monotonous humming around the outside of her head, with intervals of a thumping sensation on the right side of the head. The division of adhesions about the ossicles of the right ear, lumbar puncture, ossiculectomy of right ear, all gave but temporary relief, the tinnitus becoming more and more distressing, necessitating the administration of small doses of morphin. Destruction of hearing on the right side was suggested, but consultants advised against this procedure. Dr. Duel was then called in consultation. After noting all the necessary tests, and after discussing the probable outcome, it was decided to ablate the right labyrinth. A complete labyrinthectomy utterly failed to influence the tinnitus. The special feature of the case which caused its being placed on record was the fact that three months after the labyrinthectomy Dr. Lewis found that the patient still had hearing on that side. The tinnitus was no better. The most carefully conducted tests made by Dr. Duel confirmed this unusual finding.

Six months after the first operation a second was performed. Just before operation it was again demonstrated that the patient could repeat words shouted in the operated side, the unoperated side being stopped by a noise apparatus. At this

operation the bone wax which had been employed at the first operation to stop the flow of cerebrospinal fluid was removed from the cochlear cavity, which was apparently clear of any vestige of the cochlear apparatus. Thorough curettage of the cochlear cavity was performed, and the vestibule, which was entered from behind, and the ampullæ of the semicircular canals, were destroyed. No bone wax was used on this occasion. The wound healed and was dry for several months at the time of the report.

The important phenomenon observed in this case might cause one to question the theory of Helmholtz with reference to functions of the labyrinth. Does it support that of Shambaugh? At any rate, it should stimulate further investigations of the physiology of sound production.

DISCUSSION.

DR. GEORGE E. SHAMBAUGH, Chicago, said that the first question of importance in this case was to determine the probable cause of the ear trouble. From the history of the case alone, deafness coming on insidiously in middle life, associated with annoying tinnitus, it would appear most likely to be one of otosclerosis. This at once offered a probable explanation for the most interesting feature, namely, that the patient appeared to hear in an ear where the cochlea had been completely destroyed. The explanation that suggsted itself was this. In otosclerosis the symptom of paracusis Willisii was usually very marked. In these cases it was not unusual for a patient who had great difficulty in hearing the voice to find that in the presence of a noise—as, for example, on a railroad train—he could hear even better than a normal hearing individual. Now in the case here reported, where the cochlea in one ear had been destroyed and a noise apparatus was applied to the opposite ear, it seemed not unlikely that through the phenomena of this paracusis Willisii the patient might be able to hear even where no hearing could be detected when the same test was applied to a normal ear.

The generally accepted view was that sound perception takes place exclusively in the cochlea. If this be true, then an injury even less extensive than in this case, it would seem, must result in a total destruction of hearing in that ear. If it be true that the patient did actually hear in the operated ear, he

believed it must be accepted that the perception took place in the vestibular apparatus. He did not believe that any theory of sound perception which placed this function in the cochlea would account for hearing in an ear which had been subjected to the operation performed by Dr. Duel.

The annoyance from tinnitus aurium was much greater in some cases than in others. Some of this difference was to be accounted for by the difference in the general nervous make-up of individuals. A subjective noise which would cause only moderate annoyance to one person would in another more nervous individual almost drive to suicide.

Dr. George W. Mackenzie, Philadelphia, thought it unfortunate that careful tests were not made before anything was done, as it might then have been determined whether the lesion was in the conducting or the perceptive apparatus. It was possible in nerve lesions to have tinnitus aurium. Two cases had been reported eight years ago, in the *Wiener klin. Woch.*, by Dr. Alice V. Mackenzie, which were of syphilitic origin. He suggested that in Dr. Duel's case the condition was a post-syphilitic lesion. He did not believe the patient heard. He thought the combination of the speaking tube method with the noise apparatus would have given a different result.

Dr. Fielding O. Lewis, Philadelphia, said the patient still insisted, with the use of the noise apparatus, that she could hear. Dr. Duel had made a handsome wager that she could not hear after the first operation, but by the careful tests described had demonstrated himself a loser, both to himself and all others present. After the ear became dry, following the second operation, the speaker had tested it again with the noise apparatus, and she still said she could hear sounds but could not determine words. He had her daughter, whom she could hear best, stand by her, without speaking, and the patient again insisted that she could hear sounds but not words. She had been taken to a sanitarium. She had never had paracusis Willisii. Wassermann test was negative, and she had been given iodids. Other tests were negative.

Dr. Duel, in closing the discussion, said the functional tests had been as elaborate as they could be made. If, as might be assumed, a portion of the cochlea had been left at the first operation, the wax, impinging upon that, might have carried the sound waves in, if Dr. Shambaugh's theory is correct. If

a remnant of the cochlea had been left at the first operation, it had probably been removed at the second. The curettage of the vestibule in the first operation had not been done as thoroughly as that of the cochlea. In the second the whole labyrinth had been removed. The point he raised was whether destruction of the cochlea destroyed hearing.

Experimental Studies of the Effect of Various Atmospheric Conditions on the Upper Respiratory Tract.

DR. GERHARD H. COCKS: The purpose of the experiments upon which this contribution is based was to add to the knowledge concerning the exact place of atmospheric changes of temperature in the production of respiratory disease. In order to accomplish this, direct observations were made upon the respiratory tract under conditions which could be absolutely controlled as to temperature, humidity and air movement.

The observations were conducted under the auspices of the New York State Commission on Ventilation, who provided for the purpose two adjoining rooms, approximately ten by fourteen feet each. These rooms were so arranged that any degrees of temperature and humidity could be secured and recorded. Room A, the Control Room, was fitted with white tiled walls, and with machinery for controlling atmospheric conditions in both rooms, viz., fans, air washer, heating stacks, steam lines and ducts. Room B, the Observation Room, was also fitted with white tiled walls, covered with cork board, cemented and impervious. The two rooms, were adjacent, with a window in the common wall. Metallic mirror records were made of the results of the clinical examinations of the nasal passages in practically all experiments except those made in the hot moist room (86° F., eighty per cent relative humidity).

The experiments were made on the following divisions:

1. Series A—Examination of one hundred and thirty-one cases, changing from one atmospheric condition to another.

2. Series F, Studies in Air Movement.—Examination of seventy-seven cases, changing from one atmospheric condition to another, with fans blowing directly on the face.

3. Series B, Skin Reflexes.—Examination of fifty-seven cases, with body in one room and head in another room having a different temperature.

4. Series C, Skin Reflexes.—Examination of forty-two cases, with the body exposed to one temperature and the feet immersed in a water bath of a markedly different temperature.

5. Series G, Studies in Workers Exposed to Dry Heat.—Examination of forty-five cases of workers in dry heat (firemen, stationary engineers, boiler workers, etc.), on going from one temperature to another.

6. Series G, Studies of Outdoor Workers.—Examination of fifty-eight cases of outdoor workers (truckmen, drivers, etc.) on going from one temperature to another.

7. Series G, Studies of Cases of Atrophic Rhinitis Corresponding to Workers in Moist Heat.—Thirty-nine observations on cases of atrophic rhinitis on going from a hot dry room to a cold room, and vice versa. It was found that a large proportion of workers in hot, moist rooms (steam laundries) suffer from atrophic rhinitis. Owing to the difficulty of securing employees of laundries who could be induced to give the time required for the experiments, other cases of atrophic rhinitis were substituted for laundry workers.

8. Series G.—Examination of forty-six laundry workers (while on duty in two steam laundries in New York City).

9. Experimental observations on the larynx and trachea of dogs subjected to peripheral stimulation by means of heat and cold.

Summary and Conclusions.—Clinical experiments demonstrated that distinct changes in the mucous membranes of the nose result from changes of air temperature and humidity. In the majority of instances the reaction is one of increased swelling, moisture and redness from heat, and the reverse from cold. The effect of air blown directly upon the face by fans greatly modifies the changes observed. On going from the cold to the hot room with fans there is a decrease in the size of the inferior turbinate and in the amount of moisture. The characteristic change on passing from the hot to the cold condition with fans is an increase in the turbinates and secretion. It was further observed that moist heat produces greater changes than dry heat, while the highest percentage of cases of atrophic rhinitis was found among long-time workers in hot, moist rooms (steam laundries).

The window and foot bath experiments tend to show that

the reaction of the nasal structures to atmospheric changes is primarily direct and local, and not reflex, although evidence on this point is inconclusive. It must be remembered that turbinate reactions are very delicate, and that the changes observed were by no means constant. It would appear, however, that the reactions in the nasal mucous membranes produced by changes in atmospheric environment are too frequent and too definite to be disregarded. Consequently, he was convinced that the theory that bacterial infection is the sole cause of catarrhal inflammations of the upper air passages is not tenable, since the changes produced by environment must materially affect the incidence of infection.

DISCUSSION.

Dr. Wolff Freudenthal, New York City, considered the effect of atmospheric conditions on the nose and throat a very important question, one in which he had been interested for more than twenty years, and upon which he had written a great deal. When he first came to this country he noticed that he could not breathe as well as in Germany, and that when he went into hot apartment houses he could hardly breathe at all. He began then to investigate the amount of humidity and the temperature in these houses. The normal amount of the relative humidity should be fifty per cent, though one could live comfortably in an atmosphere of forty per cent. But in winter it went below twenty per cent. He could not agree with the essayist as to the influence of moisture in the atmosphere. The experiments were highly interesting, but not conclusive. In New York and the New England States it was not the moisture of the surrounding waters the effects of which one felt. The majority of people spend daily twenty-three hours at least in very hot and very dry rooms and not at the sea shore. He believed that dry atmospheres were conducive to dry rhinitis, and that those who live in moist atmospheres do not have this. He was surprised at Dr. Cocks' statement with reference to laundry workers having dry rhinitis. The steam, as Dr. Cocks had said, came directly up from the manglers. If applied to the hands it would burn them, and the same, applied to the mucous membrane, would cause destruction of the same. The effect was not one of moisture, but of burning. It was surprising to see how well some people could breathe

with swollen mucous membranes, whereas others would complain of being unable to do so with dry and wide nasal chambers. The latter class could not assimilate the air well. Experiments along this line had been made at the University of Kiel, and Freudenthal's views corroborated in every point. At New Bedford Station, forty miles outside of New York, experiments had been made with reference to tuberculosis, and it was surprising to see how much effect dryness of atmosphere had on these patients.

DR. ARTHUR I. WEIL, New Orleans, said this paper explained the statement, made in conversation, of one of the members of the society from Denver, to the effect that he practically never saw a case of atrophic rhinitis in that city. In New Orleans, on the contrary, the speaker saw more of this condition than of any other. Dr. Cocks' investigations showed why this should be the case. He could bear out Dr. Freudenthal's contention with reference to these patients with atrophic rhinitis complaining of lack of air. He had formerly thought that when patients complained of inability to breathe through the nose he would find hypertrophic rhinitis; now, however, he was equally prepared to find atrophic rhinitis.

DR. GEORGE F. COTT, Buffalo, called attention to a forthcoming article in the ANNALS which would bear upon the subject under discussion. Dr. Cocks did not state whether the air used in the experiments was pure or contaminated. The air one ordinarily breathed was contaminated. In experiments with the air from schools in Brooklyn there had been collected five pails of dust in five days from the air the children breathed. This was a powerful factor in determining the results.

DR. THOMAS J. GALLAGHER, Denver, believed that among the rhinologists of Denver it was the consensus of opinion that cases of atrophic rhinitis developing there were seldom encountered. The vast majority of cases seen there were in people who had lived in a low, moist climate and in whom atrophic rhinitis had already developed before coming to Colorado. Subjects of atrophic rhinitis were more uncomfortable in Denver, owing to the diminution of the humidity of the air. The turbinate bodies must throw out more fluid, and their inability to do so resulted in an increase of crust formation. However, he had seen many cases of vasomotor rhinitis develop in the high and dry climate. The cause of this was not

yet known, and the disease was peculiarly rebellious. It was certainly not due to the flora in different altitudes, as it occurred throughout the year without any amelioration, the patient remaining in the same place. He had seen remarkable results from sending the patients to the sea shore. The effect was very complex, but the good results probably come through the local influence of the air upon the nasal membrane plus the general effect upon the blood vessels and nervous system.

DR. ROBERT LEVY, Denver, did not believe atrophic rhinitis occurred rarely in Denver. It was mainly a disease originating in childhood. The cause was still in doubt. As a matter of fact, children with atrophic rhinitis were found in Denver, but, in his experience, the condition was not confined to children. It was more common in children than hypertrophic rhinitis. His clinical assistant, Dr. Cooper, was making a study of cases of atrophic rhinitis in children and adults, and he had enough cases to make a presentable showing. He had seen enough cases in the clinic alone, aside from those in private practice, to warrant his going on with the study. It was not, however, as frequently found in Denver as elsewhere.

DR. COCKS, in closing the discussion, answered Dr. Cott's question in regard to dust by stating that in his opinion the results of the tests made in the experimental chambers were not influenced by contamination with a dusty atmosphere. The physical conditions in the experimental chambers were practically ideal. Nobody was allowed in the rooms except the observers and the subjects of the experiments.

Hemilaryngectomy for Malignant Diseases—Description of New Operation With Report of Six Cases, All Recovered.

DR. JOHN E. MACKENTY presented a specimen by which he endeavors to make the closed operation as safe as the open one, without the difficulties and defects of the latter. Hemilaryngectomy stands midway between total laryngectomy and thyrotomy as a surgical choice. Thyrotomy takes the early cases of laryngeal cancer, hemilaryngectomy the later ones, and total resection the latest (or, as one might better say, the too late) ones. The statistics of recurrence are in corresponding ratio, thyrotomy leading and total laryngectomy bringing up a sorry rear. Gluck's method of hemilaryngectomy is a roundabout and tedious one, and has furthermore the dis-

advantages of permitting wound secretions readily to enter the trachea, and of giving some trouble later in converting the fissure into a potential tube. Yet a primary closure of the larynx without some way of safeguarding the trachea against wound secretion would be a grave surgical blunder. These considerations, therefore, prompted the author to attempt a modification in the accepted technic.

Operation.—The larynx should be first opened for inspection, if there is a question as to whether thyrotomy or hemilaryngectomy is indicated. Then, if hemilaryngectomy is elected, the trachea is opened just above the sternal notch. One incision is made for the laryngectomy and another for the tracheotomy. The first incision begins well up under the chin and extends to a point just below the cricoid ring in the center line. This is deepened until the thyrohyoid membrane, the thyroid and the cricoid cartilages are exposed. Care is taken not to separate the tissues laterally. The larynx is then opened in the center line, its interior cocainized and inspected. Blunt hooks or retractors are used in order to avoid injury to the edges of the cartilage, especially on the healthy side.

The trachea is next opened as low as possible. The second incision is here made over the end of the sternal notch and up to within one inch, or more, if possible, of the first incision, leaving a liberal bridge of tissue between the two incisions. The trachea is opened and a large tracheal cannula inserted. Into this is fitted a rubber tube, eighteen inches long, through which the anesthetic is continued. Before inserting the tracheal cannula, two stout silk threads are passed through the edges of the tracheal incision, one on each side, and laid one on each side of the neck. The wound is then closed fairly close up to the cannula. The object of the silk threads is to control the tracheal opening in case the tube should get displaced or come out. Traction on these threads opens the trachea. This precaution should always be taken in low tracheotomies.

The larynx is again opened with blunt hooks or narrow retractors. The trachea is cocainized and loosely packed with gauze. The patient is placed in a semi-Trendelenburg position. The skin, cervical fascia, and pretracheal muscles covering the diseased half of the larynx are carefully dissected away from the cartilage, taking care to keep them all in one

flap and not to injure the inner surface, which is composed of the pretracheal muscles, as this surface is to form the new laryngeal wall. This flap is gently held away while the removal of half of the larynx proceeds. The thyrohyoid membrane is slit laterally and the trachea divided below the cricoid ring on the diseased side. Iodoform gauze is packed into the pharynx, and is removed through the mouth when the operation is near completion. The loosened half of the larynx is now retracted, well away from the center line. If the mucous membrane over the posterior commissure and arytenoid is healthy, it is saved and lifted away from the cartilage beneath. This mucous membrane dissection is carried backwards over the posterior surface of the arytenoid and down towards, and sometimes into, the anterior aspect of the mouth of the esophagus.

The diseased half of the larynx is now removed in the usual way, being careful to save the mucous membrane flap outlined above. All bleeding points are controlled by catching only the vessels and by tying with an 00 iodized catgut. Careful hemostasis and gentle treatment of the tissues are required.

As much as possible of the raw surface left by the hemilaryngectomy must now be covered with mucous membrane. The above mentioned flap is brought downward and inward. Care should be taken to avoid tension in stitching the flap in its new position with fine iodized gut. The tracheal packing is now removed and the trachea cleared of blood clot down to the cannula. A long strip of vaselined gauze, thoroughly impregnated with bismuth, is packed into the trachea. The end of the strip is brought out at the lower end of the laryngeal incision. The larynx is packed loosely with a strip of iodoform gauze, the end of which is brought out at the same point as the tracheal packing. The gauze in the pharynx is removed through the mouth, and the feeding tube is pushed through the nose and directed into the esophagus.

The mesial edge of the pretracheal muscles is now united to the mucous membrane of the healthy side of the larynx along its anterior median aspect, using fine iodized gut. The skin edges are united with silkworm gut. The wound is left open at its lower angle, wide enough to give drainage soon for the gauze ends. Two provisional stitches are placed here, to be tied after these strips are removed, thus entirely closing the larynx. A sheet of rubber tissue, covered on both sides with

gauze, is glued by its edges with collodion to the neck, across the bridge of skin separating the two wounds. This attachment should extend laterally one-half way around the neck to keep the drainage of the laryngeal wound from the tracheal cannula.

As after-treatment Dr. Mackenty prescribed a diet of oatmeal, thoroughly cooked and strained, mixed with milk, milk-sugar or raw egg, and occasionally with melted butter. Six ounces of this mixture is forced through the esophageal tube with a piston syringe every four hours, followed by four ounces of water.

To clear the trachea of secretion, suction is used as needed. A small catheter is passed down to the bifurcation, and about ten pounds of negative pressure is applied. Dressings should be changed evey few hours. The laryngeal drain should be kept in as long as the serous flow continues. The tracheal plug may remain from three to five days. The tracheal cannula should be removed just as soon as the new larynx is open for comfortable breathing.

DISCUSSION.

DR. JOHN F. BARNHILL, Indianapolis, thought the method described would undoubtedly prove advantageous in the very early cases in which it was possible to make a diagnosis. The new feature of the method was the forming of a cavity lined by mucous membrane. This, of course, would presuppose the presence of good membrane to be used for this purpose. For this reason the method was applicable only in cases in which the disease was not very extensive. If Dr. Mackenty had not had six recoveries in his six cases, he would have been open to the criticism that he should have done laryngectomy. Semon, Butlin, and others who had done a great deal of this work, had reported better results with laryngectomy than with hemilaryngectomy. With the modern methods for keeping the secretions out of the larynx it was possible to do more than might be done otherwise. Crile, who had done a good deal of this work, advised doing two operations, the first being a low tracheotomy, for the purpose of getting the patient accustomed to the tube. In Dr. Mackenty's method that was not necessary, as he succeeded in keeping the secretions out of the trachea, so that there was no danger of the fluid dissecting its way down into the mediastinum, as happened in many cases.

He asked if there had been stricture in any of Dr. Mackenty's cases. In case there was not enough mucous membrane to cover the wound, there might be stricture after removal of the tube.

DR. MACKENTY, in closing the discussion, said one case had refused total laryngectomy. He had not had any postoperative strictures. He did not think the Semon operation applicable in any of his cases. He got enough mucous membrane to cover one-quarter or one-third of the wound in most of the cases, as he had stated in the description of the operation. He was opposed to the two-stage operation. It was not done abroad, and he did not see why it had to be done here. In going in for the second operation it was necessary to go through a septic field. In total laryngectomy he believed in the complete operation—i. e., with the gland bearing tissues of the neck. In one case there was a fairly tight point below the larynx, because he had to do more than a hemilaryngectomy. Moreover, the patient had a distorted trachea from the enlarged thyroid. Answering the question about the perichondrium, he had always taken the mucous membrane without perichondrium.

Cleft Palate and Hare Lip.

DR. OWEN SMITH: Careful study of the operative technic for cleft palate reveals three distinct methods with minor modifications:

1. Elevation or separation of the soft tissues of the palate, and suturing the denuded edges in the middle line, as advocated by Langenbeck and Warren.

2. Flap elevation, reflection or rotation, as advised by Lane.

3. Forcible closing together of the cleft by lateral pressure and retaining the parts in place by heavy metal sutures, as suggested by Brophy.

Having operated upon more than two hundred cases, and having carefully tried all three plans, the essayist unreservedly commended the second method, suggested by Lane. The most important reason for an early operation is that a large number of these patients die before they reach the age when they would be ready for operation by the older methods. His own experience leads him to the belief that fifty or sixty per cent die of inanition within the first six or eight months of infancy, if the cleft is not closed. The mortality from early operation

by the older surgeons was so great that they were forced to abandon it. In contradistinction, Lane and Brophy did not have any large percentage of deaths from their work, and in his own series by their methods he had not had a fatality. The sooner after birth the operation is performed, the less hemorrhage, while the shock to the nervous system will be very slight. The muscles of the throat after the early operation begin their activity at once and do not have time to atrophy. This atrophy takes place where operation is delayed, and the eustachian tube suffers from this disuse of the muscles. The early formation of a fibrous band between the edges of the cleft by contraction begins at once to mould the twisted face into its proper position. Before the teeth erupt an opportunity is offered to get a wider flap by extending the incision outside of the alveolus. The immediate repair of the lip adds another factor in restoring the palatal processes to their normal place. Lane's operation is designed to bridge over the cleft by means of mucoperiosteal flaps from the bony palate in front of the mucous membrane and submucous tissue from the muscular or soft palate behind. Flaps properly formed, when placed in position over the cleft, present their raw surfaces together, one overlapping the other. Fine silk sutures are used, and when tied they unite the flaps in this way and form a new, strong and complete palate. It has been the essayist's practice, in order to hasten the healing, to curette the ulcerated free border of the septum, often found at birth, and to dissect up the mucous membrane on both sides, until material enough is obtained for a flap, which is pulled down and sutured over the free edge of the curetted septum. It is never safe to operate while the ulcer is present. For some time he has thought it wiser to divide the operation into two sittings, particularly if the cleft is very wide. The technic is described in detail.

The hare lip operation employed by the essayist is designated as the lip splitting method. In this operation there is no sacrifice of tissue, and the lip may be operated upon as many times as necessary until the desired effect is obtained.

DISCUSSION.

Dr. John Edmund Mackenty, New York City, said Dr. Smith had improved upon the Lane operation. The objection he had had to the Lane operation was that it called for the

splitting of the soft palate into two parts, more or less completely ruining it as a functionating organ. He would try out Dr. Smith's method in future. He had never done a hare lip operation without undermining the tissues of the lip so as to relieve tension at the edges. It was not quite clear to him that tension would be relieved by Dr. Smith's method. It had not been his experience that such a large percentage of cleft palate patients died. He would like to hear more about the speech results in the Smith method, and it was to be hoped that Dr. Smith, in future papers, would tell of the speech results in his cases. He had used an obturator in the mouth to prevent tongue pressure, and had obtained better results when he did this. Most of his operations had been done by a modification of the Langenbeck method.

Dr. Mackenty presented a model of his obturator.

Dr. Truman W. Brophy, Chicago, said there were so many varieties of defect that it was difficult to discuss a paper on this subject. He classified hare lip under thirteen forms, and cleft palate under fifteen forms. He presented charts showing illustrations of the various forms. In discussing cleft palate it was necessary to consider the different kinds, because there were nearly as many different kinds of treatment as there were congenital defects. The object in operating upon the palate was two-fold: First, to overcome the congenital deformity, to restore the parts just as nearly as possible to normality; second, to correct the condition so as to enable the patient to speak properly when the age of speech was reached. The surgeon who failed to accomplish this failed to attain success. A cleft palate was like an open wound. A surgeon would not make a patient wait before closing an ordinary open wound, and yet many surgeons made patients wait for years before closing a cleft palate.

Lantern slide illustrations of different forms of defect were shown, and a description of his technic for each, with the reasons for the same, were given.

Dr. George L. Richards, Fall River, said, in justice to Dr. Smith's method, that he had a case under observation which corresponded to Dr. Brophy's form XIII. The patient had a good lip, a good palate, and was developing a very good voice. One would hardly know the patient was not a normal individual.

DR. SMITH, in closing the discussion, did not dispute Dr. Brophy's ability to do anything with wires. In order to pass a verdict upon the two operations, one should try both. Every case in which he had employed the Brophy operation had been an absolute failure. Dr. Brophy obtained the desired object by one method, he obtained it by another. He had no desire to criticise the Brophy operation. In the method described there was an immediate formation of fibrous tissue which drew the parts together, if taken early enough. One could obtain any desired length of palate by taking a little care in placing the flaps before beginning the sutures.

Some Observations on Turning Nystagmus.

DR. GEORGE W. MACKENZIE'S investigations, covering a period of eight years (1906 to 1914), have resulted in findings contradictory to those of Bárány on after-turning nystagmus. He believes the observations of the latter have been faulty because of inaccurate technic, and also that the wide discrepancies in the duration of after-turning nystagmus in normal individuals, claimed by Bárány, do not exist. Hence the author concludes that the hearing test is a valuable one in the diagnosis of labyrinthine conditions.

The author examined one hundred and seventeen cases in all, including nine normal individuals. The list included nearly all of the varieties of ear diseases to be met with in the average practice. They differed from Bárány's in the following particulars:

In normals, Bárány found the average duration of horizontal after-nystagmus to the right after ten turns to the left was forty-one seconds. The author found that the average duration of horizontal after-nystagmus to the right after ten turns to the left was a fraction of a second less than twenty-four seconds. Bárány found that the average duration of horizontal after-nystagmus to the left after ten turns to the right was thirty-nine seconds, and the author found that it was only twenty-four seconds. Bárány: The maximum duration for horizontal after-nystagmus to the right after ten turns to the left was ninety-eight seconds; the author: twenty-nine seconds. Bárány: The maximum duration for horizontal after nystagmus to the left after ten turns to the right was one hundred and twenty seconds; the author: thirty-one seconds.

Bárány mentions one case with no nystagmus after ten turns, and uses this as his minimum for after-turning nystagmus. The author observed two cases with apparently no nystagmus, but upon repeating the test and turning the patient at a more rapid speed, and examining carefully, he was able to note and time the nystagmus, when it was found to be of relatively short excursions and lasted the usual length of time. Bárány observed horizontal after-nystagmus averaging forty seconds in sixty individuals examined on different days. The maximum was eighty seconds; minimum, twenty-five seconds. One-fifth of the cases showed consistently the same findings; in other words, four-fifths showed variable findings. The author examined a smaller number of such cases, and found the average after ten turns for horizontal after-nystagmus to equal about twenty-four seconds. The greatest variations were but a few seconds, and these could readily have been explained on the ground of faulty observations. In a number of cases in which Bárány tried both rapid and slow turnings, he has found that after ten rapid turns the nystagmus lasted from eighteen to nineteen seconds, while after slow turns it lasted from twenty-six to thirty seconds. In one-half the cases he found the rapid turns produced a longer after-nystagmus than slower turns. The author tried patients with both rapid and slow turnings, with the result that the duration is apparently less after after slow than after rapid turns and consistently so. However, most careful tests will show them to be about equal in duration. The difference is more apparent than real, for the reason that after slow turning the nystagmus is less intensive than after rapid turning, hence less noticeable and more difficult to determine the moment of cessation. Bárány claims that with a great number of persons the horizontal nystagmus after twenty, thirty, forty, fifty and sixty turns was the same as after ten turns, adding that it appears that in the average ten turns show the Hochster Werte (highest worth, value or rate), while with a greater or less number of turns the amount diminishes. The author admits that he is not in the position to match Bárány in material, but he performed some autoexperiments of this kind, and found the nystagmus to increase consistently in duration between ten and twenty turns. He found, furthermore, less variations after twenty than after ten turns. Bárány claims that the amount of after-turning

nystagmus after twenty turns is about equal to that after five turns. The author never found this to be true in a single case in his experience. Bárány claims that after twenty or more turns there appears not infrequently, a nach-nach nystagmus (after-after-nystagmus) in the direction opposite to the after-nystagmus, lasting sometimes a minute. The author has never seen an after-after-nystagmus in many hundred examinations, including those in his list. He does not believe it exists, and will not believe it until it is shown to him. Concerning dancers, Bárány claims that with those who habitually turn to the right the duration of the horizontal turning nystagmus to the left falls considerably shorter than that to the right. The author was fortunate enough to obtain a whirling dervisher with the stage name of Hash Hash, who was a left turner. The author examined him on many occasions, and found that his duration of nystagmus was consistently the same on several occasions. The figures were reduced for both horizontal and rotatory nystagmus to both sides, and more so to the right. This one case supports the claims of Bárány.

The author further pointed out that Bárány, in his efforts to find a relationship between the semicircular canals and the eye muscles, neglected a certain caution that he himself warns against when he advises the use of opaque glasses in studying horizontal after-turning nystagmus. The author attributed Bárány's irregular findings, as compared to his own, as due to his technic, which the author believed faulty, rather than to actual irregularities in the behavior of the reflexes.

In Bárány's "Table for Differential Diagnosis of Mentioned Diseases," page 276 of the Proceedings of the Ninth International Otological Congress, he indicated with arrows the direction of spontaneous nystagmus in the column, suppuration of the right labyrinth since twenty-one days, and elsewhere states that the patient has spontaneous nystagmus to the right as well as to the left. The author remarked that this nystagmus to the right, when looking to the right, is not in the least way connected with the patient's labyrinthine condition, and that Bárány has included it among other findings in labyrinthine suppuration only supports the author's previous contention that Bárány lays more stress upon the side positions than the straightforward position of the visual axis. In Bárány's table there is no mention made of his having noted

the spontaneous nystagmus that occurs when looking straight ahead, while the author considered no other nystagmus of any value from the standpoint of the semicircular canals. When the intensity of the nystagmus does not balance in opposite directions, the author accepts it as pathologic, and the problem then is the isolation of the particular muscle or muscles involved.

NEW YORK ACADEMY OF MEDICINE, SECTION ON OTOLOGY.

Meeting of November 12, 1915.

DR. CORNELIUS D. VAN WAGENEN, CHAIRMAN, PRESIDING.

Purulent Leptomeningitis of Otitic Origin With Recovery.

DR. ISIDORE FRIESNER presented a patient who had made a spontaneous recovery from purulent leptomeningitis of otitic origin. He said that Preysing, in his essay on meningitis, stated that if one reviewed the case reports of healed meningitis, one was almost ready to believe that we were making rapid strides toward the conquest of this most formidable otologic complication. Quite a number of cases of meningitis had been reported during recent years in which, by the exhibition of one or another form of therapy, by either surgical or medical means, a cure had been effected. And yet the total of cured cases was so pitifully small that grave doubt still existed in the minds of many able observers as to whether diffuse purulent leptomeningitis ever ended in recovery. It was possible that the following case report might in some small degree help to clear up this question. It differed in one essential from most of the other cases of healed meningitis reported in that there was nothing to offer constructively. This case, which there was justification for considering a diffuse purulent leptomeningitis, recovered spontaneously. The young man, J. B., sixteen years old, went to Dr. Phillips' clinic at the Manhattan Eye, Ear and Throat Hospital on June 13, 1915. His right ear had been discharging since he was ten months old. After operation it was learned that except for this discharge his ear had never troubled him until several days before entrance into the hospital. The patient was then seized with sudden pain in the ear, accompanied by headache, fever and vomiting. Functional tests showed his labyrinth active and normal. On June 15th Dr. Friesner had assisted Dr. Shook, who was then house surgeon of the Ear Division, to perform a radical mastoidectomy. The mastoid was found sclerosed;

there was neither pus nor cholesteatoma; the middle ear contained a little granulation tissue. The dura of the middle fossa was exposed and it appeared normal. Immediately following the operation the boy's temperature rose to 105°, accompanied by intense headache and vomiting. During the succeeding eleven days his temperature ranged between 102° and 105.5°, he vomited frequently, was delirious, his cervical vertebræ were tender, the neck was rigid and head retracted. There was a marked Kernig in both legs and an herpetic eruption about the lips and the opposite ear. On the day following operation lumbar puncture showed very turbid cerebrospinal fluid; microscopically it contained pus cells and fairly numerous short chain streptococci, and culture from the spinal fluid showed streptococci. The labyrinth was reexamined several times and found active. Permission for exploration was withheld until, believing the boy's condition was so desperate that the condition was a meningitis which would prove rapdily fatal, it was thought unwise to interfere. The fever persisted for forty-one days, and during the first three weeks he was frequently delirious. The headaches became less severe after the first two weeks. The rigidity of the neck persisted for a month, and the Kernig was positive even after his temperature was normal. Late in the disease, severe girdle pains and pains in the arms and legs were observed; these were believed to be referred pains due to irritation of the posterior special roots. Even after improvement was evident it was doubted that recovery could ensue, as this was believed to be one of those intermittent meningitides described by Brieger, and it was expected that the boy, who appeared on the road to recovery, would suddenly become unconscious and die within a few hours. The radical cavity has healed nicely and is perfectly dry. Healing is present to a very small degree and the caloric is weakly positive.

DISCUSSION.

DR. H. L. LYNAH said that he had had a case of otitic meningitis resulting from scarlet fever. The patient was operated on and injected with fifty cubic centimeters antistreptococcus serum. An acute urticarial rash developed, which was regarded as a favorable prognostic sign; this proved correct, as recovery followed.

Dr. Wells P. Eagleton said that he had been particularly interested in Dr. Friesner's paper, as it dealt with a number of points which he himself had long been interested in. One point to which Dr. Friesner had referred he had never seen mentioned in print, but had observed it once and had written about it, but he had then lost his nerve and failed to publish it, namely, that thrombosis is not prior to cerebellar abscess, but secondary to it. Several years ago he had a patient with a cerebellar abscess. At that time all the surgeons were following the teachings of McEwen, who said that cerebellar abscess was generally caused by sinus thrombosis. This patient had no symptoms of sinus thrombosis. He became comatose. Finally the cerebellum was opened and a large abscess was found, which should have been opened two or three weeks earlier. On cutting through into the sinus the latter was found to be empty. The man died some time later, and postmortem showed no trouble with the sinus. The fact of finding an empty sinus with a big cerebellar abscess made a great impression on him, and on thinking it over he came to the conclusion that with a greatly increased cranial pressure the first thing to give way would be the large venous trunks, and if there was a superficial cerebellar abscess, it seemed possible that it might press out the blood, as we now know that a tumor does press the blood out of the sinuses to make room for itself. The infection being in proximity with an empty sinus might tend to cause a secondary infection of its walls. He thought that might be the explanation, though he had never heard such a case reported.

Otitis Media Purulenta Chronica—Mastoidectomy—Meningitis With Unusual Focal Symptoms—Postmortem Findings.

Dr. C. D. Van Wagenen read this case report of a man, Peter P., age twenty years, single, who was admitted July 3, 1915, to the Manhattan Eye, Ear and Throat Hospital with a diagnosis of otitis media purulenta chronica, right and left, acute mastoiditis right; emergency operation. This case, occupying the bed adjoining that of the very unusual case of purulent meningitis of otitic origin which recovered spontaneously, presented here tonight by Dr. Isidore Friesner, was reported for its contrasting meningitic picture and its illuminating and valuable autopsy. The family history was negative, as was the

previous history, in the main; the patient, however, supplied the important fact that there had been an intermittent discharge from both ears since early childhood. More recently, in 1913, this patient had been confined to the ward by a right otitis media purulenta acuta, which had apparently completely resolved under myringotomy, rest in bed and appropriate local treatment; a residual condition of the left middle ear was observed at this time; the patient then entirely disappeared from observation until has last admission to the hospital, when he gave a history of having had a discharge from both ears for fourteen weeks, with headache gradually increasing in severity in both the frontal and occipital regions, but unaccompanied at any time by dizziness, nausea or vomiting. Upon receiving the report, about the noon hour, from the house surgeon, Dr. Brownlee, that there were marked signs of a right mastoid involvement, and that the patient seemed a very sick man with temperature of 101°, respirations 24 and pulse 106, preparation for operation was ordered. The operation, a simple mastoidectomy, was performed by Dr. Van Wagenen on the afternoon of the day of admission. The whole area of the cellular mastoid was found in a necrotic condition, bathed in foul smelling pus from which gas, under pressure, immediately issued. An extensive exposure of the lateral sinus showed it to be thickly and uniformly covered by a layer of dirty gray granulations, resilient and pulsating under the palpating finger. The wound was left wide open, loosely packed with sterile gauze, a heavy wet saline dressing was applied and the patient was returned to the ward. As the left ear was found to be discharging moderately, hydrogen peroxid, followed by a saline douche, was ordered q.—3—h. During the night of July 4th the temperature rose to 105° F., with respirations 24 and pulse 100, but sank to 104° in the early morning, being possibly influenced by an alcohol sponge. Dr. James G. Dwyer, the pathologist of the hospital, reported that the smear taken from the operating field showed a mixed infection with the pneumococcus mucosus predominating. The patient was resting quietly. On July 5th Dr. Dwyer reported the blood culture as negative after twenty-four hours. As a matter of fact it was negative throughout. The temperature, pulse and respiration remained high and the patient was somewhat restless. Systematic treatment of the left ear was producing results. Beginning with

July 6th the patient grew progressively worse. There was a conjugate strabismus. The fundi were found to be normal except for a slight engorgement of vessels. There was a rather profuse hemorrhage from the nose. The patient began complaining again of pain in the head; one observer thought that this pain could be sufficiently well localized in the left mastoid to permit of a diagnosis of mastoiditis, especially when taken with the discharge and appearance in the middle ear. The appearance of a left facial paresis during the closing hours of this day seemed to strengthen this belief, but the increasing prominence of the meningitic picture overshadowed all else. The next day, July 7th, paresis of the left arm and leg appeared and the restlessness increased at times to an active delirium. Dr. Dwyer examined about thirty cubic centimeters of turbid fluid from a lumbar puncture in two tubes; there was considerable precipitate of pus made up of red and white cells and pus cells. Sugar reducing substance was absent; lactic acid marked. Smear was negative bacterially; culture after twenty-four hours was negative and finally negative. Death ensued, with a gradually falling temperature, at 9:50 p. m., July 8th.

At autopsy Dr. Dwyer found general leptomeningitis with a large collection of pus between the cerebrum and the cerebellum, especially on the left side, simulating abscess, and thus giving focal symptoms; pus in large amount over the cerebral cortex, especially following the longitudinal sinus; considerable necrosis of the anterior end of the right frontal lobe, not at the bottom of the lobe, but in the ascending frontal surface; abscess of the right frontal lobe was not yet broken down into pus. The sinuses were all open and clear. Left mastoid very pneumatic and clean. Paresis of left arm and leg was due to cerebral lesion at fissure of Rolando, and left facial was due to pressure there or at the point of collection in the tentorium. Culture showed pneumococcus mucosus.

DISCUSSION.

DR. M. NICOLL, JR., said that he would like to hear Dr. Dwyer, who made the examination of the lumbar puncture, tell something more about it, as sterility of the turbid fluid was not a usual feature.

DR. J. G. DWYER said that quite often in a smear the organ-

isms were found without a direct growth, but that in this lumbar puncture the culture was negative.

Dr. Meirhof showed two X-ray plates. One of a man of thirty-five years, with a history which showed he had been ill five weeks, complaining of pain in his ear, in which incision of the drum had been made; temperature of 103° and headache. Examination of the ear showed no local symptoms, no exudate at the time, no swelling of the canal, no tenderness over the mastoid on deep pressure. Ear tests showed practically a loss of hearing. Blood culture was negative. Leucocytosis was high. The mastoid looked cloudy in the radiograph, and the radiologist thought there were some changes in the sinus. The X-ray picture was the means of giving some idea of the condition present. There was distinct contrast of the normal to the abnormal side. Lumbar puncture was made, and the fluid came away very cloudy. At operation pure pus fell out of the mastoid. The sinus looked blue.

The other case was a boy of fifteen years. In August, while at camp, he had a swelling behind the left ear which he thought was the result of a spider's sting. Three months later he had pain over the left mastoid which was very severe. Six years before he had had otitis. There was no exudate; he could hear a watch tick at fifteen inches; an X-ray was made which showed a normal mastoid on the affected side. Blood count was normal. He continued this way for several weeks, and it was not believed that he had any disease, but that the condition was one of hysteria or neurasthenia. The father finally admitted he had struck the boy over the ear rather violently in anger.

Dr. Harold Hays said that he wished Dr. Dixon were present to interpret the first picture, as from the appearance of the plate he did not consider the mastoid very extensively involved, though of course it must have been, as there was pus present. He asked if there was exposure of the dura, and suggested the possibility that the case was one of meningitis in which the mastoid had become involved.

Dr. Ernst Danziger said that the case as reported struck him as an absolutely clearly defined one. The headache, the fever, and the sudden development of complete deafness of the affected ear was a typical clinical picture of an acute purulent labyrinthitis. He regretted that there had been no

mention of nystagmus or tubercular reaction. The thrombosis was only of secondary importance.

DR. H. B. BLACKWELL said that two years ago he reported two cases in which there were no objective signs of mastoiditis. They were X-rayed, and the findings were different in the two cases. The X-ray findings in one showed the mastoid was involved. In the other, where the X-ray was negative, meningitis developed seventy-two hours after the picture was taken, and the patient died. The mastoid was opened and showed that it was very slightly diseased. The point to be emphasized in X-ray diagnoses is that it is impossible for the X-ray to show the grave character of the mastoiditis unless the mastoid has become pretty well diseased. Sometimes the X-ray will show a normal condition which may result in meningitis, as in his case. Diagnosis in these cases has to be made on the more or less indefinite clinical symptoms which the patient presents —the malaise, history, headache and restlessness, the slight temperature which they sometimes have, 102.4°, and lastly the X-ray findings were to be taken. If the X-ray was negative, the condition might not be very grave, but if positive, the diagnosis was confirmed.

Micropathology of Brain Abscess.

DR. WELLS P. EAGLETON read a paper on the micropathology of two cases of brain abscess, illustrated by lantern slides.

DISCUSSION.

DR. H. S. MARTLAND showed some specimens and said that the case of encapsulated abscess that Dr. Eagleton had referred to was from a case that he had autopsied. The brain specimen, showing the abscess, he passed around for examination. The patient had a dural endothelioma situated in the right cerebellopontine angle. Four months before his death he was trephined over the right cerebral hemisphere near the median line, and a puncture of the right lateral ventricle was made. At autopsy the right cerebral hemisphere presented a round abscess cavity, four to five centimeters in diameter, containing foul, greenish pus, in which a few streptococci were found. The walls of the abscess cavity were four to five centimeters in thickness, and on microscopic examination presented

three distinct layers; the inner was composed of disintegrating and sloughing brain tissue, fibrin and bacteria infiltrated with polynuclears; the middle was composed of connective tissue with extensive fibroblast proliferation, due to stimulation from the presence of blood and fibrin; and the outer was made up of edematous brain tissue containing a protective wall of endothelial leucocytes. There was no infection of the lateral ventricle, the inner wall of the abscess approaching very close, however, to the ependyma of the right lateral ventricle. From the outer part of the wall of the abscess to the brain surface was an area of old cerebral softening, the remains of the track of the needle during puncture, proving that the infection was carried into the brain at the time of the needle puncture. A second specimen that Dr. Martland passed around for examination showed two small abscesses of the brain due to pneumococcus infection, and occurring as a complication of bronchiectasis.

DR. GUTMAN said that he believed brain abscess of otitic origin to be always an extension of infection, and asked Dr. Eagleton to explain how the thrombosis phlebitis, coming down from the brain, could cause brain abscess, and also asked how he could explain the length of time it took for the capsule to form.

DR. M. NICOLL, JR., said that he wished to thank Dr. Eagleton for his splendid exposition of the pathology of brain abscess, and asked if Dr. Eagleton had seen the thrombosis of the vein during the operation or at postmortem.

DR. EAGLETON replied that he thought Ballance had misled many about looking for the stalk. That procedure had hindered progress. The reason for the absence of the stalk was very simple and was now well recognized. The cortex of the brain had a very complete vascular supply, while the interior of the brain had a very poor vascular supply. Infection reached the cortex from the infected area in the ear, but the supply of the cortex was so great that the local death from the nutritional disturbance did not occur. The thrombosed vessel, when it once reached the intramedullary portions, reached the portion where the brain was dependent for its nutrition on the small venous trunk. All abscesses extended inward for the same reason. They never extended outward, as they went toward the ventricles, not outward. He had seen

surgeons open the head and, not finding the abscess, leave the dura open, saying that would give the abscess a chance to come out. Because of the local death inward, all the line of resistance was toward the ventricle and not toward the cortex. The otologists as a whole were to be congratulated upon the advanced work they were accomplishing in the physiology of the cerebellum. The neurologists had contributed but little surgically, but the otologists had been dealing with the problem from the surgical standpoint and had learned much about the very delicate mechanism of the neurology of the cerebellum.

Aural Complications in Exanthemata.

Dr. Henry L. Lynah read an article on the aural complications in exanthemata. He said that the percentage of otitic complications were governed by the degree of the local throat lesion. They were caused by the extension of membrane through the eustachian tube. The scarlet fever percentage was high in the nasopharyngeal type. There was early and late infection. The aural lesion was often obscured. In measles the percentage was high in the catarrhal stage with fulminating aural complications. Age, pain, temperature, heat and cold were factors. There was a question if latent complications were due to aural lesions. There were anomalous types. There was sinus thrombosis with and without aural involvement. The complications were sometimes brain abscess, labyrinthitis and meningitis. Preventive measures were removal of tonsils and adenoids; nose and throat irrigations; injection of antistreptococcus serum. Radical or conservative treatment had effect on the hearing apparatus and the mortality of the case.

DISCUSSION.

Dr. M. Nicoll, Jr., said that Dr. Lynah's paper seemed to cover the ground very well. In reference to lavage being likely to cause middle ear infection as well as the Casselberry position, it was easy to conceive that the latter might induce infection through the posterior nares, but that lavage could not be held responsible for infection, and those two should be separated. But neither of those two methods are used now. It had always been interesting why diphtheria did not cause middle ear lesions; not the diphtheria bacillus alone, but the strep-

tococcus found with it; why was there not a suppurative condition of the middle ear, as in scarlet fever? Regarding irrigations, he had been so opposed in his theory that he hesitated to reaffirm it, but he believed that irrigation, done properly, without roughness or undue pressure, in certain cases with a great deal of discharge, was the proper procedure; that middle ear disease did not follow any more readily than if it was not done; that it was rational treatment and could not do any harm. Where the heart was weak and the child struggled, it might be a poor procedure, but there were certian cases where it ought to be done. In regard to serum locally, he was more in favor of that than intravenously; it had some clearing up value and was soothing and agreeable to the patient.

Dr. G. Pisek said he thought the section was more especially interested in the aural complications. It was interesting to look back into history and appreciate that the aural discharges were the last stand of the adherents of the humoral pathology. Dr. Lynah gave the statistics of complications in the infectious diseases and they were low, but that at certain seasons of the year and at different periods the infection had been of a more virulent type, and then more complications appeared. In the summer particularly the infectious diseases are few in number; but at all times of the year, in modern, properly equipped hospitals, the complications are becoming more rare. The interns, for example, are equipped with an auroscope, and they make it a part of their routine duty to make careful examinations of the ear. With such a routine the more important complications are apt to be forestalled. If there was marked nasal involvement, there was more apt to be aural involvement, and then the ears were more carefully watched. The pediatrist was often called in to assist the otologist, from the differential standpoint, in cases of suspected mastoiditis where the question of pneumonia came up. If the child had recently had a mastoidectomy, bulb involvement or pneumonia were probable. Blood culture was often necessary, though it should be recognized that only under certain conditions was the blood culture reliable. Unless, for example, the blood culture was taken just before the rise in temperature, negative blood culture might be reported. The pediatrist and aurist needed to take counsel together in these complicated infections, and they should insist on blood culture being made

and taken at the proper time. The mortality could be reduced if early diagnosis were made.

Dr. Meirhof said that Dr. Lynah's paper seemed a comprehensive one, but that there were a few points he wished to touch upon. The question of the hearing of these children interested him very much, as an examination of two hundred and eighty mutes had shown their condition to be due to suppurative otitis from scarlet fever, diphtheria, etc., and made him believe that it is not known what the final outcome of these cases will be; the question was, was the deafness of these mutes due to indifference in their treatment, or would appropriate treatment have saved their hearing? There was a very rapid destructive process going on. The use of the syringe tended to keep up the formation of granular tissue.

Dr. Opdyke said he had seen only one case where there was a distinctly diphtheritic membrane in any case of mastoiditis, and it was a very virulent case. Notwithstanding the injection of diphtheria antitoxin and thorough evacuation of each sequestrum, the patient succumbed. There was nasal and aural involvement, and both mastoids were diphtheritically affected. Speaking of measles, he was called into see a girl who was prostrated with whooping cough, which was followed by diphtheria and then measles. Both ears were affected and a mastoidectomy was done on one side. There was no pus in the mastoid antrum. Lumbar puncture was negative. The rash of the measles did not come out; the temperature was 105°; on the seventh day after the mastoid operation the rash came out and the child succumbed. He wondered if that retained rash was the cause of death, or was it meningo-encephalitis.

Dr. John A. Robinson said that four years ago he saw a patient who complained of sore throat for two days and stuffiness in her left ear. Temperature was 102°. She looked ill. The mucous membrane of the oropharynx and faucial pillars were deeply congested. The uvula was edematous. The glands at the angle of the jaw were enlarged and the membrane was congested. Owing to the thickness of the parts, posterior rhinoscopy was unsatisfactory. With the nasopharyngoscope of Holmes the pharyngeal opening of the left tube was seen to be coated with a grayish membrane. A culture made from a smear showed this bacteriologically to contain Klebs-Loeffler

bacilli. No other membrane was visible. The exudate was so characteristic that immediate administration of antitoxin was urged to the family physician in a neighboring suburb, which he did the following evening. Twenty-four hours later, membrane appeared on both pillars and on the left side of the pharyngeal wall. The exudate did not extend into the nose. The patient developed a mild acute otitis which subsided without myringotomy. She received four doses of ten thousand units. As sequelæ she has a markedly narrow tube, a low whisper distance of six feet, and a low pitched tinnitus.

DR. J. J. MCCOY said that he was impressed by Dr. Lynah's paper with the low percentage of involvement of the labyrinth, and thought the secret of success in these cases was the early treatment. There were many cass of severe sepsis in scarlet fever in which the kidney was involved and the child had single or double mastoiditis, when there was a question whether immediate operation should be done, or the antrum simply drained, which it would seem advisable to do at that time, later completing the mastoid.

DR. LYNAH said he agreed that in such cases the serious operation should be delayed, and that it was better to merely do myringotomy at first. If the drum membrane sloughed out, it made no difference in the hearing, as that was injured anyway.

The meeting was closed after Dr. John A. Robinson had been nominated as Chairman and Dr. Harold Hays as Secretary for the coming year.

NEW YORK OTOLOGICAL SOCIETY.

Meeting of January, 1916.

A Case of Congenital Bilateral Microtia—Presented Five Years After Operation.

DR. JOHN R. PAGE: The patient, a small boy, seven years of age, was first seen by Dr. Page when he was six weeks old, and was observed from time to time for two years before the right ear was operated on. The left ear was operated on one year later.

A certain degree of hearing had been demonstrated by the child's attention being attracted by whistles, etc. X-ray suggested the presence of a tympanum and ossicles on both sides. Dr. Page said that the patient's family were very enthusiastic in their praise of the result, as the boy had learned to talk, and the mother assured him that she had no more difficulty in talking with him than she had with the other children. When spoken to from another room he responded quickly.

The case was reported in detail, and was printed in the Transactions of the American Otological Society in 1914. There was found on both sides a total bony atresia and a contracted tympanum with rudimentary ossicles. There was now a radical cavity on both sides which admitted a speculum of medium size on one side and a large speculum on the other. Considerable cicatricial contraction had occurred, but allowance had been made for it at the time of operation.

Dr. Page said that in none of the textbooks had he been able to find any encouragement to operate on such a case. In spite of the authorities, Dr. Page said he believed that in the majority of such cases, if the child was perfectly normal otherwise, the hearing could be improved by proper operative interference because of the fact that the essential organ of hearing

is developed from an entirely different origin than that of the external auditory canal and auricle. Dr. Berens had had a similar case, and had obtained a good result from operation.

It has been suggested as one of the frequent causes of failure in these cases that the anterior wall of the bony canal is invariably absent, and the articulation of the jaw rests far back, practically against the mastoid process. It has been suggested that ignorance of this fact has been the cause of so many operative failures. The operator, in attempting to follow what he supposed to be the line of the bony canal, encounters the articulation of the jaw or the facial nerve. The best procedure is to enter far back on the mastoid, expose the sinus and middle temporal fossa, if necessary, and get into the antrum and use the horizontal semicircular canal as a landmark; work from the aditus out and widen up a large cavity, exposing well the internal wall of the tympanum, and treat it as a radical cavity with the skin grafts, etc.

DISCUSSION.

Dr. Thomas J. Harris said that he wanted to ask Dr. Page whether a good many of these cases which had been operated on showed complete absence of all vestige of the middle ear. The speaker said it was his impression that such was the case in these patients. The explanation that the middle ear had never been entered because of a faulty channel might be the correct one, but after the most extensive operation they could find nothing at all.

Dr. Wendell C. Phillips said that he had given some study to these cases, and had concluded the crucial point was to decide whether the patient had hearing. It was proper to operate if the patient could hear. Most of the cases under his observation had no hearing, and it seemed to him an unwise procedure to make a canal where there was none. The speaker stated that he had a lifelong opportunity to study one case in a member of his own family, who had one rudimentary auricle,

but seemed to have no hearing at all. He had no external auditory canal, but a fairly well shaped ear, which had remained infantile during his whole life, and a well formed eustachian tube. Inflation seemed to simply open up the tube. The speaker said this was the case he had illustrated in his textbook.

Dr. John R. Page, in reply to Dr. Phillips, said he thought, contrary to what Dr. Phillips had said, that hearing could be demonstrated in practically all of these cases. That investigation had shown the deformity had never occurred in both the internal and the external ear at the same time except in cases of markedly undeveloped and deformed infants and nonviable embryos. He did not think that operation was warranted in the unilateral case where there was good hearing in one ear. After hearing had been demonstrated in this case, X-ray pictures were taken and the child was operated on when he was two years old. One year later the other ear was operated on.

Dr. T. Passmore Berens said he had such a case as the one to which Dr. Page had referred. He had forgotten the exact age of the patient, but thought the child was about three and one-half or perhaps four years of age; an institution child, a foundling. On one side there was only a rudimentary tragus, no external and no bony canal. On the other side there was a little miniature auricle, not much bigger than the nail of the forefinger, with no meatus. Her attention could be attracted by any kind of noise. If someone stamped on the floor with the foot she would look around.

Dr. Berens said he operated on one side on the ground that the deformity was so great that it would do her no harm, even if the hearing should not be improved. He selected the most rudimentary side with the small bit of a tragus, and cut down to where he supposed the canal might have been and came to the capsule of the jaw. This was not opened. He followed from the temporal ridge downward and inward, hugging the

internal table covering the middle fossa, and finally fell into the attic, and from the attic went into the antrum and found there a rudimentary incus but no malleus. The incus came out in the operation, and one could see the stapes, the nerve and the external semicircular canal. On that side Dr. Berens performed a saucer operation and scooped out all the bone he possibly could, and made as flat a wound as he was able. It healed nicely. The patient was kept in the hospital for a couple of months. She commenced to mumble with the other children and began to hear. Dr. Berens operated on the other side, and there also failed to find any bony canal, but found a meatus and the ossicles, which healed open. She was kept in the hospital for six months, and laughed and talked with the other patients. She could hear in the ordinary way about as well as the boy presented. If she was called by name she would come, even if her back were turned. The operations were performed about one year before Dr. Page published his reprint. So far as Dr. Berens could judge, he did not see what harm, outside of surgical shock, could come from the operation.

Bullet Wound of the External Auditory Canal.

Dr. Francis J. Quinlan reported a case of an Italian who had been brought to his service, at St. Vincent's Hospital, on December 24th of this year. He was a bartender by occupation, and had received a bullet wound in his head. The man was left unconscious, and an ambulance brought him to the hospital. Dr. Quinlan saw the patient the next day. The ear presented an enormous mass like a potato, and Dr. Quinlan mopped out the external parts. After two weeks of treatment the tissues were reduced in size and an exploratory operation made of the canal. The external auditory canal was entered, but still occluded the drum. The probe determined what seemed to be a hard metallic substance. The pistol had been placed as near to the external auditory canal as was possible.

After one week of waiting and constant supplication the man finally consented to an operation.

Dr. Quinlan opened the ear externally along the lines of the mastoid, and found a mass impacted in the canal up to the drum, like molten lead poured into a cavity. With the greatest difficulty in chiseling he took away a very large, irregular-shaped bullet. The man had a slight facial paralysis and considerable bleeding. The man did nicely for a week after the operation, and then complained of pain anteriorly. By this time the condition had improved and the inflammatory zone had disappeared. By careful probing upwards and forwards, Dr. Quinlan felt what seemed to be another bullet. After working for three-quarters of an hour, while he was in great pain, the doctor removed a second somewhat smaller looking bullet. The patient left the hospital one night without leave of absence. Dr. Quinlan saw him since, and the man was perfectly well with slightly impaired hearing on that side. He thought, however, that the patient had an old residual condition, which might account for the loss in hearing. Dr. Quinlan never before saw a bullet so placed as to fill up the canal and press upon it. The man was pursuing his old occupation as bartender.

DISCUSSION.

Dr. Charles E. Perkins said that he recalled a case which had come to Dr. Dench's clinic. The man had placed a revolver against and shot himself in the mastoid, and some operation had been performed to take out the bullet. They made an X-ray picture, and the condition looked as though a piece of plaster had struck the bone. There seemed to be twenty small pieces of the bullet all over that side. Some of them, Dr. Perkins said, must have been in the brain. The wound healed, the patient was fairly comfortable, there was no facial paralysis, but in looking at the X-ray one would not have thought that bone could cut a bullet into so many pieces.

Dr. Francis J. Quinlan said that in his case there were about eleven smaller pieces of the bullet impacted into the mastoid process of the bone.

Dr. John B. Rae reported the case of a bullet wound, occurring five or six years previously in a man who had shot himself with a twenty-two caliber pistol. He was unconscious and

taken to a general hospital, where he stated the bullet had been removed. After leaving the hospital he was under the care of his family physician for about three weeks, and then presented himself at the Postgraduate Hospital. The patient then had a facial paralysis and an acute suppurating mastoid. There was a copious discharge of pus from the canal. Dr. Rae thought it advisable to do a radical operation, believing that the bullet had been removed. On getting into the middle ear he discovered that a large fragment, almost one-half of the bullet, had been jammed into the middle ear, just as if it had been poured in. Strange to relate, Dr. Rae said, the patient had very good hearing and a functionating vestibular apparatus. The patient reported at Christmas from San Francisco, when he stated his facial paralysis was almost gone. Dr. Rae said that the splitting up of such bullets was very interesting.

Facial Paralysis From Otitis Media Suppurativa Chronica.

Dr. Wendell C. Phillips reported a case in a young man, age thirty years, who had come to his clinic at the Postgraduate Hospital the Friday previous with a chronic suppuration of the left ear. The condition had existed for a number of years, and at the time Dr. Phillips first saw him the patient had a fairly complete facial paralysis, and stated that he had lost his hearing in the affected ear. The paralysis had occurred two and a half months previously, at which time he had a great deal of vertigo, considerable pain in his ear and nausea, which kept up for several days. The nausea and vertigo eventually subsided, there was no nystagmus, and testing the labyrinth revealed total absence of hearing and a nonfunctionating static labyrinth. There was a large mass of cholesteatoma occluding the attic and inner tympanic wall. Dr. Phillips had performed the radical mastoid operation on account of the cholesteatoma. There was no fistula of the semicircular canals. In the tympanum he found extensive necrotic areas. A large space, probably involving the section of bone between the oval and round windows, had been broken down. In touching the granulations around this area the probe had entered the vestibule. There was also much granulation tissue in the region of the promontory. No promontory was found. While curetting the granulation tissue from the floor of the tympanum a gush of blood appeared, and it was very evident that he had wounded

the jugular bulb. The hemorrhage was not uncontrollable, and on packing the cavity the bleeding stopped, but later, during an attempt to complete the operation, the same return flow of blood appeared. The facial nerve exposure was found just above the oval window. He had not performed the labyrinth operation, inasmuch as nature had saved this man's life by walling off the inner territory of the labyrinth.

DISCUSSION.

DR. JOHN D. RICHARDS said he could not see why Dr. Phillips had passed a probe into that labyrinth. From Dr. Phillips' remarks he gathered that there was a mass of granulation tissue covering the round and oval windows. In passing a probe under such circumstances through an oval window, it is impossible by the tactile sense to tell whether the window (granting the stapes is absent) is sealed off or not by a protecting barrier. Granting that such a labyrinth is functionally dead, it may have become so at some antecedent time, and after the original inflammatory process has subsided a normal labyrinth fluid again fills the labyrinth. We are then confronted with a functionally dead labyrinth containing a normal labyrinth fluid, which is not a surgical labyrinth. If Dr. Phillips had gone in to explore the labyrinth to find out if pus were present, he should have done more than to have merely passed a probe through the oval window.

DR. WENDELL C. PHILLIPS said that at the time he operated the area of bone around the oval window was wide open, and that he did not push his probe into it, but the probe entered a wide open door. He said he thought that Dr. Richards was laboring under a wrong impression as to the conditions described. It had seemed to him that the whole section between the oval and round windows was gone. There was absolutely no force used. The probe dropped right in. The probe was not a small probe at all, he used it as a searcher, which just dropped into a wide opening.

Deafness Following Salvarsan Injection.

DR. JOHN D. RICHARDS reported a case he had seen during the past summer, who had had syphilis some twenty odd years ago and had taken the usual three year treatment. Each year

subsequently the patient had gone to Hot Springs, Arkansas, for two months. During the past summer, for some reason Dr. Richards did not know, the patient had his blood examined, and the syphilographer found it to show a positive Wassermann reaction. The patient was given salvarsan intravenously, and just about two months subsequently he awoke one morning to find that he had suddenly become completely deaf in one ear. Dr. Richards saw him on the following day. With the deafness the patient had no disturbance of equilibrium, no vertigo and no other phenomena associated with the vestibular apparatus. The affected ear was absolutely deaf and the function totally gone. Dr. Richards said that the best thing to be done was another injection of salvarsan, which the patient had injected that afternoon. Dr. Richards saw him exactly one week from the second injection of salvarsan, and the patient related the following:

Three days subsequent to his salvarsan injection, which was given on Saturday, he began to hear fairly well. On Thursday, five days after the injection, he stated he could hear as well as ever. He was an intelligent man and had tested the hearing with his watch and made the examinations himself. Dr. Richards saw him the following Saturday, just one week subsequently, when function had completely returned. He heard the forks throughout the scale, with no shortening of tone duration, and also heard the regulation whisper Dr. Richards used in his office at normal distance. There was only the shortening of a few seconds from the normal in the bone conduction. The speaker said the case was interesting from the suddenness of the onset, the nature of the lesion, and the total ablation of cochleal function without vestibular disturbance, and the quick response to salvarsan.

Dr. Richards said that the second injection of salvarsan had been given the day following the onset of the deafness. The speaker said he had seen a good many cases where the duration of deafness was over two months. He had had a case with a similar history where the deafness had lasted for six months, which had been put on several injections of salvarsan, with improvement.

DISCUSSION.

Dr. Francis J. Quinlan said he wanted to speak of a case that was given salvarsan with a luetic history, and absolute

deafness had followed, the patient remaining in that condition to the present day. The man at the time of treatment received three intravenous injections, was apparently in good health and had very good hearing. According to his own citation, he lost his hearing after the second injection, and after the third was absolutely deaf.

DR. JOHN D. RICHARDS said that this particular case was given salvarsan more quickly following the deafness than any other case he had ever seen, and that he never before saw a case which had recovered so quickly. Excellent results had been reported by Ellis and Swift, who drew very satisfactory conclusions in regard to the administration of salvarsan in these cases. They had relied largely upon spinal puncture; more so than on the blood examination for their tests. Dr. Richards saw a good number of these cases, where salvarsan was given some months after the deafness, in which there was a partial but very satisfactory restoration of the hearing.

Acute Mastoiditis and Ethmoid Infection.

DR. THOMAS J. HARRIS reported a case, in which he had been called in consultation, of acute mastoiditis, which presented several points of interest, especially on account of being affected with the prevailing epidemic of grippe. The patient was a young married woman, and the middle ear and mastoid involvement had been going on for twelve days. There was a variable temperature, reaching up to 102°, and the pulse, which was showing decided toxic elements, was also rather variable —from 120 to 130. The woman had always been well. There was also an acute ethmoid. The patient had never had any more than a certain amount of discomfort in the ear, and no mastoid tenderness at all. The suppuration was described as diminishing. The patient indeed was rather exulting in the fact that it was letting up. During the interval of the twelve days the patient had received stock vaccins and afterwards autogenous vaccins. Examination showed a general involvement of the mastoid bone. The bacteriologic findings showed a streptococcus organism. Dr. Harris said the case was interesting from the standpoint of the danger of using vaccins, and did not think a case like that warranted it. They should certainly not use stock vaccins, and he did not think that even autogenous vaccins ought to be employed, and that valuable

time was being lost in depending upon them. The case illustrated that the absence of mastoid tenderness was something they could not put a great deal of emphasis on. The fact that there was a general mastoid involvement was in itself a sufficient indication for immediate interference. The case of course had been complicated by the ethmoidal condition previous to when Dr. Harris saw it. He did not know how the other gentlemen looked at it, but he thought they must take the view of operating much earlier and advising entrance into the mastoid than is usually done in such a case as this. In this case with grippe, he thought the lapse of twelve days almost unwarranted.

DISCUSSION.

DR. FRANK T. HOPKINS said he would like to report a case which had come to his office with a history of a slight discharge in the ear and extreme tenderness over the mastoid, the patient not being able to sleep for two nights. The tympanic membrane was somewhat bulging. Dr. Hopkins incised it freely and gave the woman a serum injection of mixed influenza stock vaccin, and told her that if she were not better within twenty-four to forty-eight hours, a mastoid operation would have to be performed. When she came to his office the next morning the pain in the mastoid was much less. She asked that the operation be postponed another day. At the end of the second day the pain was gone and the discharge lessened. The patient went on to recovery without any further mastoid trouble. This case was suggestive in that sometimes the injections of serum were of benefit. This was not such an early case, and the trouble had been going on for one week before she was seen by Dr. Hopkins. He said that sometimes the injections of serum would work very satisfactorily.

DR. WILLIAM C. BRAISLIN said he might refer to a case he operated on the previous Thursday. A practitioner caller him in three weeks previously to incise a membrane. A culture from this ear, the right, showed staphylococcus pyogenes aureus. The patient had received one dose of the polyvalent (Van Cott's) mixed vaccin, and subsequently got four others. The case was again seen in the fourth week of her illness, when she was operated upon immediately on account of the pronounced mastoid symptoms. They found both the mastoids in very bad shape, pus extending to the dura over the lateral

sinuses. Both sinuses were exposed. This case was one of the first mastoids, Dr. Braislin said, he had seen treated with vaccins in a thoroughgoing manner for a considerable period previous to operation, and the impression gained was not favorable to its use in acute cases of mastoiditis. Cultures were also taken from both mastoids at time of operation. The right and left mastoids both contained staphylococci and streptococci, but the left more streptococci than right.

Dr. Wendel C. Phillips said that the case Dr. Hopkins reported followed exactly in the line that the majority who do not have vaccins do. Dr. Phillips would not attribute recovery to the vaccin in that case. He desired to emphasize the fact that the tendency among otologists is to delay operation on the mastoid for a longer period than they did a few years ago. Unless the symptoms were extremely severe, Dr. Phillips doubted if many men operated during the first week of the disease. He said he was greatly interested in the discussion at the San Francisco meeting of the American Medical Association, Section on Diseases of the Ear, Nose and Throat. At this meeting Dr. Norval H. Pierce made a plea for postponing all operations on the mastoid, excepting complicated ones, until the third week. He stated that there were very many operative cases that did not have very much mastoid tenderness. His experience was that in cases which had gone eight, ten or twelve days, if there is no cessation in the discharge and the temperature persisted, they had indications that pointed to the necessity for operative interference.

Dr. Thomas J. Harris said that in reporting his case he had endeavored to bring out the point that they should not let one or perhaps two symptoms determine the definite time or day of operation, or at what time they should enter the ear, whenever there are evidences of toxemia. In a case where there was a temperature and which showed general involvement and profuse discharge, any great delay was a bad thing. Often if these cases were gone into too late, various involvements would be found. Dr. Harris said he had recently seen a case where he would have been very glad if he had been called in before. There was not much temperature in this case, but a decided breaking down.

Dr. Frank T. Hopkins said that he had given vaccins in some cases within a week or ten days after the inflammation

started. In one case about a year previously, in a child, the patient showed a very bad mastoid suppuration and inflammation of the other ear. The one ear had been discharging for a week with great profusion. Dr. Hopkins gave a staphylococcus vaccin, and the ear, which had been discharging for days, cleared up very quickly. The child was in excellent condition within a very short time. The speaker had given vaccins to a patient with antrum disease. The pain had been going on, not severely, but continuously, for a week or ten days, and under this treatment the antrum cleared up promptly.

Exposure of Capsule of Jaw by Cholesteatoma.

DR. T. PASSMORE BERENS said that while doing a Stacke operation for the students in the Manhattan Eye, Ear and Throat Hospital, he uncovered a tremendous cholesteatoma. In the first place the whole anterior wall of the canal was eroded and the capsule of the jaw was exposed. Dr. Berens did not enter it. The other interesting point was that in taking out the cholesteatoma he found the ossicles almost normally located, but absolutely bound down to the inner wall of the ear. There was no necrosis of the ossicles. There was no drum membrane, and the ossicles looked simply plastered down. She had a very stiff jaw. The wound is in a satisfactory condition.

DISCUSSION.

DR. CHARLES E. PERKINS said he had a case similar to Dr. Berens' the year previously. The patient gave a short history. The otologist who had referred the patient was in doubt as to whether the patient had a furuncle or not. There was a large swelling of the canal present. The patient refused to have anything done until an X-ray was taken, and if that was positive the doctor in attendance on the patient consented to an operation in the hospital. On the first report of the examination of the plate there seemed to be nothing the matter with the mastoid. Dr. Perkins was in favor of operating, but they sent her home. The pathologist looked at it the next day, after the plate had become dry, and said it was an operative case. She was brought back to the hospital, and Dr. Perkins opened the mastoid. There were two openings in the mastoid cortex in and around the ear. She could not open the jaws. She said

she had first noticed something wrong with her ear about two months previously. When Dr. Perkins entered the antrum he found it filled with cholesteatomatous matter. The anterior wall, clear to the tympanic ring, was absent, and the cholesteatomatous mass buried around the condyle of the jaw. The posterior wall of the canal along the antrum was entirely broken down. There was a fistulous opening in the horizontal semicircular canal. He did not put a probe into it, but left it alone. Her hearing returned and the active symptoms disappeared and she completely recovered.

Dr. T. Passmore Berens said that his case was a true cholesteoma without granulation tissue.